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ABSTRACT

This list of energy resource materials is broken down into five categories: (1) general resources; (2) electricity; (3) nuclear and fossil fuels; (4) conservation; and (5) future fuels. (An added feature for New York residents is a concluding list of resources available gratis from New York electric companies). Materials cited include audiovisual aids, charts, activities, books, experiments, games, booklets, and periodicals. Each entry is annotated to show its potential value and use in the classroom. Appropriate grade levels are suggested, but these will vary with the locale and the way the material is employed. Only those items thought to be significantly helpful to students and/or teachers are included. Each resource is evaluated as strongly recommended for student use without restrictions, recommended for student use under teacher guidance, or recommended for teacher reference. Two matrices are also provided. A grade level-topic matrix enables users to find resources on a specific energy topic appropriate for a given instructional level. A grade level-resource matrix enables users to locate for a given instructional level the kinds of curricular materials that which will best complement intended energy lessons. (JN)

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ENERGY EDUCATION:

A Catalog of Resources

New York Energy Education Project

SE 044 015

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Introduction

Plugging In

Everyone has heard of the energy crisis; some even believe that it still exists. We do, in fact, have serious energy problems that have been growing over the past two decades.

The basic dilemma is one of supply and demand. Exploration for and production of fossil fuels have not kept up with the increasing demand. The United States has come to rely heavily upon foreign oil and gas. The difference between the amount of energy we produce and the amount we consume results in an "energy gap" with many serious consequences. It not only threatens our national security but places our balance of payments and total economy in jeopardy. It also keeps world fossil fuel prices high at a time when many developing nations are stymied by lack of fuel.

Can we close our "energy gap"? Yes, if we act promptly. Domestic production of fuels will not be able to completely replace imports in meeting energy demands. We must, therefore, conserve to reduce consumption of oil, gas, and electricity. As we tighten our energy belts, we must also further develop the fuel resource this country has in greatest supply -- namely coal. Nuclear energy may make a greater contribution despite serious opposition from some. And we must also look to alternative sources of power such as the sun, the depths of the earth, the wind, and nuclear fusion. Meanwhile, we must remain informed, "plugged in."

Education: Wired for the Future

If our nation is to deal with the energy situation successfully, it will require the help of informed people. As with environmental issues, many future decisions will require trade-offs and the exercise of sound judgment. Basic knowledge and the ability to interpret, analyze, and evaluate information pertaining to energy are required in order to appreciate the intricacies of the problems and choose wise personal, corporate, and social policies.

Young people need to be sensitized to concepts and issues involving energy. Their future well-being will depend upon a more comprehensive understanding of science and technology and of the way science and technology interact with social, political, and economic developments. Educators of the present must insure that students are prepared for these future challenges, but to do this they need energy education resource materials. This catalog suggests many resources that should aid the teacher in this important task.

Switching On

Of course, it has not been possible to include all the excellent energy education materials now available. A catalog that did would be hopelessly unwieldy. The purpose here has been to give a useful sample.

The material has been arranged under several relevant headings. Brief overviews introduce each section and subheadings further categorize the resources within a section.

Each resource is annotated to show its potential value and use in the classroom. Appropriate grade levels are suggested, but these will vary with the locale and the way the material is employed.

Only those items thought to be significantly helpful to students and/or teachers are included. Each resource is evaluated according to the key:

SR - Strongly recommended for student use without restrictions.
GR - Recommended for student use under teacher guidance.
TR - Recommended for teacher reference.

Many of the materials presented are available free of charge from their sources. Please be reasonable in your requests as supplies are often limited or restricted. When fees exist, they are noted.

Power Grids

Although the citations in this booklet have been deliberately arranged to encourage a "window-shopping" approach, it is recognized that the busy teacher may at times need to locate appropriate resources quickly. To meet this need, two matrices have been created which are shown on the next pages.

The Grade Level-Topic Matrix enables you to find the resources on a specific energy topic that are appropriate for a given instructional level. The numbers in each cell correspond to the similarly numbered citations in the text.

The Grade Level-Resource Type Matrix enables you to locate for a given instructional level the kinds of curricular materials which will best complement your intended lessons on energy.

Identify the citations by topic and level in the Grade Level-Topic Matrix. Then refer to the Grade Level-Resource Type Matrix to find out whether the items cited are films, charts, activities, or books. You can then turn to the descriptions of each item in the text for more information.

Topic/Grade Level Matrix

Grade Level ▼ / Energy Topic ►	General Energy	Electricity	Oil	Gas	Coal	Uranium	Conservation – General	Conservation – Home	Conservation – Industry	Conservation – Transportation	General Alternative Energy Sources	Breeders/Fusion	Geothermal	Wind	Solar	Environment
K-3	2, 3, 8, 16, 21, 26, 32, 36, 39		77		92		120				138			162, 165		21, 32, 36, 39
4-6	1, 2, 3, 12, 14, 16, 21, 24, 27, 32, 36, 39, 48, 49, 54		77	79	96		115, 117, 120, 135, 181	1[illegible]5, 125, 137		116	138		160	137, 162, 181	137, 171, 181	21, 27, 32, 36, 39, 115
7-8	1, 2, 4, 6, 7, 11, 13, 16, 20, 21, 24, 27, 32, 33, 35, 36, 37, 38, 39, 48, 49, 53, 54	61	65, 69, 70, 73	79, 80, 83, 84, 85	87, 89, 90, 91, 96	100, 104, 106	117, 118, 119, 121, 122, 130, 132, 133, 135, 181	116, 125, 136, 137	126	116, 136	140, 143, 144, 145	150	153, 155, 156, 158, 159, 160	137, 161, 163, 181	137, 179, 171, 172, 174, 175, 181, 182	21, 27, 32, 36, 39, 87, 88, 90, 126, 130, 133, 153
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Teacher Materials	5, 10, 15, 17, 19, 23, 24, 25, 27, 28, 30, 31, 40, 41, 42, 43, 44, 46, 50, 52	55, 57, 59, 60	62, 63, 64, 66, 68, 71	82	93, 93	98, 101, 105, 106, 107, 108, 109, 110	132	112, 129, 136, 137	127, 129	123, 136	139, 141, 142	149, 151	154	137, 164, 166, 167, 168, 169	137, 172, 177, 179, 180, 183	15, 27, 40, 44, 46, 52, 57, 60, 88, 97, 101, 105, 107, 109, 110, 127, 149, 164

Grade Level/Resource Type Matrix

Grade Level ▼ / Resource Type ►	Films/Slides/ Filmstrips	Charts/Posters	Student Activities	Experiments	Games	Books	Booklets	Periodicals	Other
K-3	32, 92, 165	32, 92	2, 3, 8, 16, 21, 26, 32, 36, 39, 92, 138, 162			77			120
4-6	27, 32, 135, 137	24, 32, 160	2, 3, 12, 14, 16, 21, 32, 36, 39, 48, 54, 115, 117, 138, 162, 171, 181	48, 181	125	77	1, 79, 96	49	116, 120
7-8	7, 11, 20, 27, 32, 37, 65, 70, 73, 84, 90, 92, 95, 121, 126, 130, 133, 135, 137, 143, 144, 145, 150, 155, 158, 159, 163, 170, 174, 175, 182	24, 32, 33, 80, 83, 160	2, 4, 6, 12, 16, 21, 32, 35, 36, 38, 39, 48, 53, 54, 80, 83, 88, 117, 118, 156, 171, 181	48, 61, 85, 104, 118, 119, 140, 156, 181	125	35, 161	1, 4, 69, 79, 87, 88, 89, 96, 100, 106, 122, 132, 136, 153, 172	49	116
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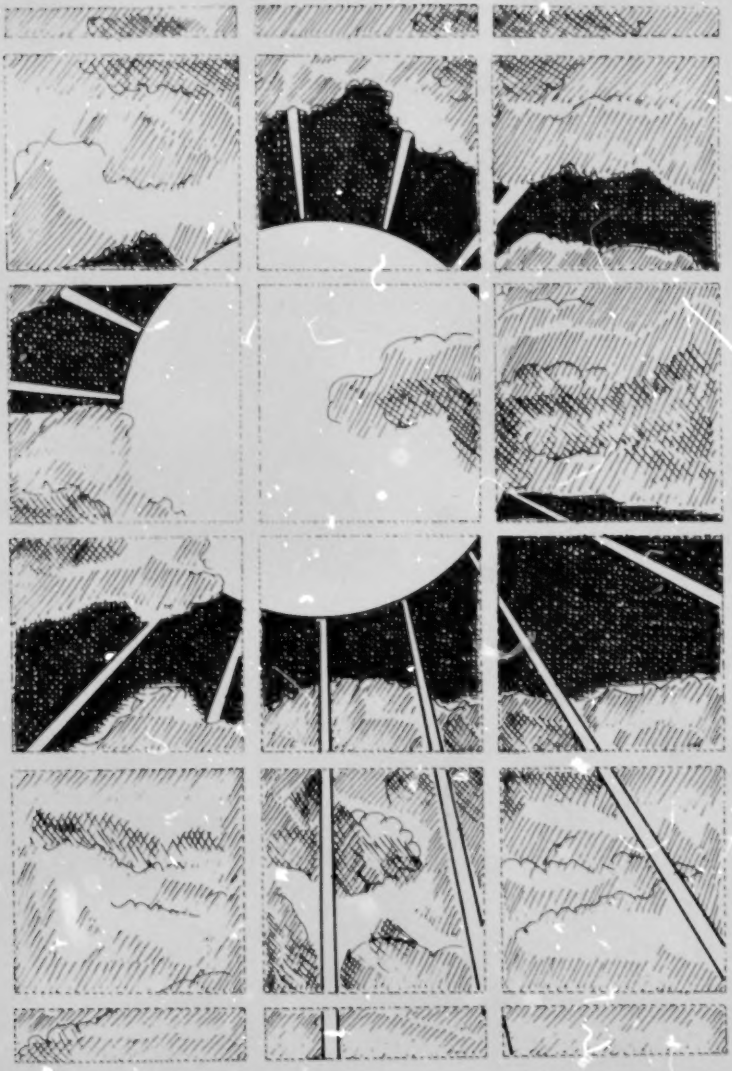
Teacher Materials	19, 27, 137	24	88, 129			5, 6, 17, 23, 41, 44, 46, 50, 57, 129, 156, 166, 167, 173, 179, 183	15, 31, 40, 42, 43, 55, 59, 60, 62, 63, 64, 66, 68, 71, 82, 88, 93, 97, 98, 101, 105, 106, 107, 108, 109, 110, 112, 113, 123, 127, 132, 136, 139, 142, 149, 154, 164, 168, 172, 180	10, 25, 30, 141, 169, 177	28



E·N·L·I·G·H·T·E·N·M·E·N·T

General Resources

Closing the energy gap is a complex and multifaceted problem, not likely to yield to simple solutions. The following materials will help students and teachers begin to explore energy and related issues in all their dimensions.

(1) THE AMAZING ENERGY EXPEDITION: A PLAY TO READ AND ACT OUT, reprint from the 10/82 and 11/82 issues of Ranger Rick's Nature Magazine. National Wildlife Federation, 1412 Sixteenth Street, N.W., Washington, D.C. 20036. (15 pages, $1.00)

Rosey needs to prepare a report on energy for school and her brother Gus will help her. Before the children can leave their yard for the library, Zapper the Rocket whisks them away to new adventures. Visits to a prehistoric cave, Victorian London, and a twentieth century Middle Eastern desert convince Rosey and Gus that each age has relied greatly upon a different energy source and that transitions to new forms took place with reasonable ease. In the fifth scene, an air controller introduces Rosey and Gus to the "Energy Stars," who, in the twenty-first century, are all doing their part to insure energy security. This is a creative, fast-moving play with music and some comedy included. The emphasis given to the various energy sources is balanced and appropriate. Upper elementary and middle school youngsters should enjoy staging and acting out this play. Suggestions for set designs and costumes are included. GR

(2) AWARD WINNING ENERGY EDUCATION ACTIVITIES FOR ELEMENTARY AND HIGH SCHOOL TEACHERS. U.S. Department of Energy, Technical Information Center, P.O. Box 62, Oak Ridge, TN 37830. (38 page booklet)

Eleven winning entries to a National Science Teachers Association Teacher Participation Contest are described so that the units might be replicated by elementary or secondary teachers. All aspects of energy are addressed, from fossil fuel sources and metallic recycling to solar energy and wind power. Profusely illustrated, the majority of the activities are at the middle and high school levels. GR

(3) THE BEST OF ENERGY BOOK: GRADES 1/3. (135 page book, $7.95)

THE BEST OF ENERGY BOOK: GRADES 4/6. (160 page book, $7.95)

Modern Curriculum Press, 13900 Prospect Road, Cleveland, OH 44136.

Each of these books is filled with multidisciplinary lessons on energy for the elementary school. The ideas are drawn from many sources but all are developed into a standard lesson format including the appropriate grade level, time needed, the concept revealed, the objective, materials and background, step-by-step procedures, and necessary student worksheets. Activities appropriate to science, social studies, art, math, and language arts are included. Four fundamental messages stressing the primacy of the sun, energy transformation, resource conservation, and environmental awareness serve to organize the lessons of each book. The busy teacher will find many infusion opportunities in these volumes as well as annotated bibliographies of other resources and films. The organization and graphics are attractive and manage to project a sense of humor. The two volume set can be purchased for $14. GR

(4) CAREER AWARENESS KIT. Chevron Career Awareness, 742 Bancroft Way, Berkeley, CA 94710. (26 career booklets, 33 page student reference guide, and 20 page teacher's guide)

This kit is an attractive introduction to the diversity of careers available within large corporations such as Chevron. While several occupations addressed are energy-related (oil field operator, geologist, refinery craftsman, drilling representative, chemical engineer, etc.), many others (employment representative, tax attorney, draftsman, computer operator, marine officer, etc.) are more general in application. Each booklet begins with an eye-catching quotation, followed by a comprehensive description of the tasks, required skills, and joys and frustrations of the job. The fourth page of each booklet provides information pertaining to educational background, work experience, starting salary, and future prospects. The Student Reference Guide summarizes each of the 26 careers presented, indicates the educational prerequisites necessary, and lists professional organizations to contact for additional information about particular careers. The Teacher's Guide indicates how the kit was developed, provides sources of additional job data, and matches careers to relevant high school subjects. Most valuable is a section suggesting ways to use and supplement the career booklets. Thirty-seven activities are described and listed under five basic questions that can help students discover jobs appropriate and interesting to them and learn what they can do to prepare for those careers. Flexible use is emphasized throughout, making this kit a fine resource for middle and high school students. GR

(5) A CONCEPTUAL FRAMEWORK FOR ENERGY EDUCATION, K-12. National Technical Information Service, U.S. Department of Commerce, Springfield, VA 22161. (140 page book; $13.50 for printed copy, $4.00 for microfiche)

This document was prepared in the hope that a comprehensive "spelling-out" of fundamental energy principles, concepts, and facts would help create a common vocabulary among energy educators and stimulate the creation of effective K-12 programs. Five broad cognitive and affective goals of energy education are provided and suggested characteristics of an energy-literate citizen listed. The main body of the work is divided into thirteen sections which, in outline form,

identify the related generalizations that might serve as the basis for curriculum development. The topics addressed are as follows: Conversion and Measurement of Energy, Energy Flow in the Biosphere, Human Use of Energy, Energy History of the United States, Energy from Fossil Fuels, Energy from Nuclear Reactions, Energy from Solar Technologies, Electricity as an Energy Carrier, Economic and Financial Aspects of Energy Use, Ethical Issues in Energy Use, Conservation of Energy, Shelter-Related Conservation, and Transportation Conservation. Collectively, these sections contain a great wealth of material, all logically organized. It is made clear that the sequences and emphasis might well be modified in planning curricula and instruction for specific contexts. This point is affirmed by listings of possible energy-related objectives appropriate for each grade level in K-12 programs in social studies and science. Pertinent resources are also included. The book concludes with an extensive bibliography pertaining to curriculum materials, directories, curricular planning, data on implementation problems, inservice training, and local energy data for local curriculum developers.

While it is stated that this book is intended as a tool for curriculum specialists rather than for the classroom teacher, it should be remembered that many teachers are necessarily involved in curriculum development and will find this document helpful as a reference for choosing resources and establishing intended learning outcomes in energy, either for a specific course or a sequential program. TR

(6) THE ECONOMICS OF ENERGY: A TEACHING KIT. Joint Council on Economic Education. 1212 Avenue of the Americas, New York, NY 10036. (163 page curriculum, $16 including postage and handling)

Many of the difficulties relating to energy supply in the past decade have been shown to have had economic bases. Even today, marketplace dynamics largely determine the prices and quantities of fossil fuels. This curriculum strives to acquaint junior and senior high school students with the analytic tools of the economist so that they can better interpret the past and present energy situations. The looseleaf notebook is divided into six sections. Part I provides an overview of energy economics, including U.S. energy use before 1970, the growth and influence of OPEC, governmental regulation of oil markets and price controls, and the effects of higher energy prices on inflation. Part II presents eleven instructional activities which introduce students to economics concepts as revealed by energy facts and events. Interpretation of graphs, simulations, and discussions are encouraged. Part III contains a reading for advanced students on energy policy options for oil. Pre- and post-tests for junior and senior high school students comprise Part IV. A fifth section provides annotations of curriculum guides, teaching units and activities, and background resources for teachers and students. Part VI consists of the visuals and handouts which support the activities of Part II. Overall, the program is quite well done, although much of it will be beyond the comprehension of most junior high youngsters. Still, this is a timely and much needed resource. GR

(7) ENERGY--A FAMILY ALBUM. New York State Energy Office, Audio-Visual Library, 2 Rockefeller Plaza, Albany, NY 12223. (16 mm film, 9 minutes, free on loan)

This film can best be used to initiate a unit on energy in secondary school classes. After a short historical account of energy use, the present plans for conservation and for shifting dependence to coal and alternative sources are examined. Geothermal and solar contributions are also noted. SR

(8) ENERGY ACTIVITIES WITH ENERGY ANT. U.S. Department of Energy, Technical Information Center, P.O. Box 62, Oak Ridge, TN 37830. (28 page booklet)

Elementary school children will find this booklet an entertaining way to learn more about energy sources and present difficulties. Cut-outs, puzzles, riddles, games, and pictures to color will stimulate much activity. SR

(9) ENERGY ADVENTURE. Amoco Teaching Aids, P.O. Box 1400 K, Dayton, OH 45414. (32 page teaching resource guide, 10 charts and graphs, and 8 spirit masters, $1.00 per kit)

This program provides senior high school students with a comprehensive introduction to energy sources, conservation, technological developments, and economic considerations. Eight units focus upon energy concepts and history, petroleum processing and use, the production and regulation of natural gas, coal mining and use, electrical generation and transmission, alternative sources, efforts at conservation, and energy economics. Each unit provides substantial background information, teaching suggestions, and possible activities. The spirit masters supplement the units and can be used flexibly; the charts and graphs highlight the text and are suitable for projection or replication. These materials are very content and concept dense and would be most effective in teacher-centered classrooms. However, the components of this resource could be fairly easily modified so as to invite greater student participation and multidisciplinary applications. GR

(10) ENERGY & EDUCATION. National Science Teachers Association, 1742 Connecticut Avenue, N.W., Washington, D.C. 20009. (newsletter published five times a year, individual subscription $9/year, bulk subscriptions of 75 or more at $7/year)

The national newsletter of the energy education community, this resource is a "must" for the teacher involved at the local level. Each issue leads off with an editorial written by a leading authority in the field, followed by sections devoted to free and inexpensive materials, book reviews, up-to-date facts concerning the energy situation, news pertaining to energy education, and a calendar of events. The no-nonsense format and concise writing style should appeal to the busy instructor. TR

(11) ENERGY AND NEW YORK STATE. New York State Energy Office, Audio-Visual Library, 2 Rockefeller Plaza, Albany, NY 12223. (16 mm film, 27 minutes, free on loan)

New York State's energy situation is unique, with particular needs, problems, and assets. This film examines the types and sources of energy resources used in New York and details our gas, oil, and electrical distribution systems. Recent solar, wind, and recycling applications are also discussed, as well as various conservation strategies. The film begins with an interesting historical perspective of energy development in New York State. This film would be best used in secondary social studies classes. SR

(12) THE ENERGY CHALLENGE. U.S. Department of Energy, Technical Information Center, P.O. Box 62, Oak Ridge, TN 37830. (a booklet of spirit masters with a teacher's guide)

A program structured around 24 ditto masters dealing with general energy use and supplies, fossil fuels, alternative energy sources, energy conservation, and contemporary concerns has been developed for students in the fifth through eighth grades. Activities included vary from interpreting simple charts and graphs to conducting interviews and solving basic problems. The teacher's guide sorts the activities into units, providing objectives, background information, vocabulary, suggested approaches, and possible extensions for each. With an interdisciplinary focus, some attempt has been made to build logical sequences across several activities. A highly recommended curricular resource. SR

(13) THE ENERGY CRISIS: OPPOSING VIEWPOINTS. Greenhaven Press, Inc., 577 Shoreview Park Road, St. Paul, MN 55112. (144 page book; single copy $1.65; for orders under $15.00 prepay and add $2.00 for shipping and insurance)

This book is one of a series of volumes addressing controversial, contemporary issues. Its purpose is to inform students of the wide variety of opinions existing among even the experts on energy use and development. In analyzing the different positions, students are thought to be better able to formulate their own points of view. Four energy-related questions form the chapters of this book. Is there an energy crisis? Is nuclear power an acceptable alternative? Is the energy consumer exploited? What are our energy alternatives? For each question, several newspaper, magazine, or journal articles are reprinted to suggest the spectrum of opinion. The editors provide key questions to focus the reading of each article. Several discussion-type activities are scattered through the text to promote critical thinking skills, such as: distinguishing between fact and opinion, distinguishing between statements that are provable and those that are not, distinguishing primary from secondary sources, understanding stereotypes, and determining priorities.

While the "hard-hitting," popular writing in this book generates more questions than answers, it should stimulate debate and further research among secondary students. The volume is a useful and fairly atypical resource, best employed by a teacher well grounded in the topics discussed. GR

(14) THE ENERGY CRISIS: WHAT YOU CAN DO ABOUT IT. Amoco Teaching Aids, P.O. Box 1400 K, Dayton, OH 45414. (one file folder containing five spirit masters, 50¢)

While very similar in format to the Your Energy World materials, the depth of analysis and understanding required is substantially less. The five activity sheets focus upon contemporary energy use, primary energy sources, ways to conserve, oil processing and discovery, and alternative sources. Directions for teachers are provided for each spirit master. This item, best utilized in grades 4-6, serves as an introduction to the dimensions of the energy crisis. CR

(15) ENERGY DILEMMAS. (39 page booklet)

ENERGY OPTIONS. (55 page booklet)

League of Women Voters Education Fund. Available from the New York State Energy Office, Office of Communications, 2 Rockefeller Plaza, Albany, NY 12223.

These booklets provide a comprehensive review of energy resources in the current political, social and economic settings of our country and the world. Each booklet has been researched by the Energy Staff of the League of Women Voters Education Fund and their professional consultants. The League maintains a policy of presenting all sides of the complex issues involved, based upon available facts. GR

(16) ENERGY EDUCATION CURRICULUM PROJECT. Indiana Department of Public Instruction, Division of Curriculum, Room 229, State House, Indianapolis, IN 46204. (order only those resources appropriate to your grade level and subject area)

The state of Indiana provides K-12 curricular materials free of charge upon request. The following curriculum units are available:

AN ENERGY CURRICULUM FOR THE ELEMENTARY GRADES. This program is a well-structured curriculum for grades K-6. Three units each contain three chapters which in turn are composed of six lessons. A rationale and objectives are provided for each chapter. Each lesson contains steps to take in completing the main activity, adaptations to different grade levels and subjects (language arts and math), and supplemental visual material. UNIT I: ENERGY AND YOU (144 pages) introduces students in K-1 to personal and home energy use, indicating the importance of conservation. UNIT II: ENERGY IN YOUR COMMUNITY (146 pages) broadens second and third grade students' perspectives to community use of energy so they can analyze their habits within a larger context. UNIT III: ENERGY IN ACTION (139 pages) promotes group decision-making among fourth, fifth, and sixth graders as they consider energy issues and problems and suggest solutions. Each unit lists additional instructional materials and each chapter contains assessment activities. While most of the activities are paper and pencil oriented, the wealth of material provided should insure

many ideas worthy of adaptation. These are core science/social studies units with interdisciplinary possibilities. GR

AN ENERGY CURRICULUM FOR THE MIDDLE GRADES. Two units have been developed which integrate with seventh and eighth grade social studies curricula. Each chapter within the units is composed of a teacher's guide, adaptation lessons (for science, language arts, and practical arts), the primary lessons, and assessment sheets. UNIT I: ENERGY AND WORLD CULTURES (232 pages) contains chapters relating energy resources and use to Sub-Saharan Africa, Europe, Asia, and North Africa-Middle East. UNIT II: ENERGY AND AMERICAN HISTORY (180 pages) has chapters devoted to energy and Colonial America, Industrialism, and the Post-War Period. Each unit also provides excellent introductory material including suggestions for class and school energy education activities, a word glossary, and annotated resources. GR

LESSONS FROM AN ENERGY CURRICULUM FOR THE SENIOR HIGH GRADES. Nine interdisciplinary units have been developed which emphasize fundamental concepts of energy use, measurement, conversion, and conservation. Each unit contains several lessons which contain a title, objectives, background information, activities, and resources. A teacher's guide explains the program structure and format and includes an infusion matrix and resource list. While the units were adopted from existing sources, they are well organized and often invite hands-on participation from students in grades 9-12. Unit titles are as follows:

UNIT I:	ENERGY DECISION MAKING (HOUSING AND HOME FURNISHING)
UNIT II:	ENERGY CONSUMPTION AND CONSERVATION IN THE HOME
UNIT III:	ENERGY: FOOD PRODUCTION AND PREPARATION
UNIT IV:	ENERGY AND ECONOMICS (RESIDENTIAL AND AGRICULTURAL)
UNIT V:	ENERGY AND AGRICULTURE
UNIT VI:	FOSSIL FUELS AND ENERGY ALTERNATIVES (SOLAR, COAL)
UNIT VII:	ENERGY CONVERSION
UNIT VIII:	ENERGY MEASUREMENT
UNIT IX:	ENERGY CONSERVATION AND THE LAW

High school teachers contemplating instruction in energy should peruse these materials. GR

(17) ENERGY EDUCATION PROGRAMS: ELEMENTARY SCHOOL PROGRAMS AND RESOURCES. Compiled by Herbert L. Coon and John F. Disinger. (41 page booklet, $1.50)

ENERGY EDUCATION PROGRAMS: HIGH SCHOOL PROGRAMS AND RESOURCES. Compiled by Herbert L. Coon and John F. Disinger. (39 page booklet, $1.50)

ERIC Clearinghouse for Science, Mathematics, and Environmental Education, The Ohio State University, College of Education and School of Natural Resources, 1200 Chambers Road, 3rd Floor, Columbus, OH 43212.

These two booklets provide descriptions of how more than two dozen elementary and secondary teachers have included energy education in their instructional programs. The reports, written by the teachers themselves, give much practical information pertaining to their teaching approaches, the nature of the student activities, and means of evaluating student achievements. Following these descriptions, each booklet provides an annotated bibliography of references useful to teachers hoping to initiate or improve energy education programs.

While these documents are now several years old and some of the annotated items will be dated, the model programs cited should be helpful to teachers as sources of ideas and strategies. TR

(18) ENERGY: FACING UP TO THE PROBLEM, GETTING DOWN TO SOLUTIONS. National Geographic Society, Dept. 5000, Washington, D.C. 20036. (115 page book, single copy: $1.45, 10-99 copies: $1.15 each)

In its unique and respected style, the National Geographic Society presents a thoroughly fascinating look at America's energy dilemmas, challenges, and adventures. Through statistics, anecdotes, diagrams, and absorbing photography, this volume focuses upon our present predicament, the consequences of "auto mania," the drive toward conservation and development of alternative energy sources, the problems and promise of synfuels, and the return to coal exploitation. Also included is a colorful atlas of America's oil, natural gas, coal, geothermal, and solar energy resources accompanied by illuminating discussions and diagrams. Widely differing views of how to approach the energy problem are obtained from six experts in the field. A listing of additional information sources completes the document.

This book is a joy to peruse and read, making it an excellent text for a senior high school energy elective. With more teacher guidance, the resource might be used with middle school youngsters as well. Its stimulating approach should insure much student interest and spur on more intensive research into the topics described. Few documents are as balanced, or address as successfully the impact of energy development upon the human condition. SR

(19) ENERGY FILMS AND PUBLICATIONS. New York State Energy Office, Office of Communications, 2 Rockefeller Plaza, Albany, NY 12223. (16 page booklet)

This booklet describes energy films and publications available through the State Energy Office. The films are available on a free-loan basis, and several of them are excellent for school age children. Requests for films must be made well in advance of the date needed and all borrowed films must be returned via UPS. TR

(20) ENERGY - FINDING OUR WAY. Modern Talking Picture Service, Film Scheduling Center, 5000 Park Street North, St. Petersburg, FL 33709. (16 mm film, 14 minutes, free on loan)

We have become profligate in our use of energy and must now better conserve and develop new alternative sources. This is the message which this film conveys through fairly striking visual imagery. A good introduction for secondary students. SR

(21) ENERGY, FOOD, AND YOU: AN INTERDISCIPLINARY CURRICULUM GUIDE FOR ELEMENTARY SCHOOLS. (367 page curriculum, $5.00)

ENERGY, FOOD, AND YOU: AN INTERDISCIPLINARY CURRICULUM GUIDE FOR SECONDARY SCHOOLS. (381 page curriculum, $5.00)

Energy, Food, and You Program: Christina Peterson, Coordinator; Washington State Office of Environmental Education, 2000 N.E. Perkins Way, Seattle, WA 98155.

These curriculum guides were developed with several goals in mind: (1) to help students understand how nonrenewable forms of energy are used in the U.S. food system in production, processing, marketing, and preparation of food; (2) to make students aware of the "hidden" energy requirements of the food system and the environmental impact of their food habits; (3) to help students understand which nutrients are required by their bodies and how they are utilized, and (4) to encourage students to consider more efficient use of fossil fuel resources to meet their nutritional needs and to rely more upon renewable sources in the food system. For each document, these goals are translated into major concepts and their supportive subconcepts which serve to organize and clarify the more than 100 activities provided. In each volume, activities related to virtually every subject area are included, with a helpful key provided. Each activity includes a title, concept or subconcept addressed, appropriate subject area, grade level, objectives, materials, procedures, bibliography and resources, and, in many cases, teacher comments derived from trial testing in the classroom. A great deal of graphic material is presented to supplement the activities and students are involved in a host of experiences which should strengthen their reading, writing, interpretive, and decision-making skills. While the emphasis is upon food and nutrition, a great many energy fundamentals are explored in meaningful contexts. Created by teachers for teachers, these flexible and often creative guides are well worth their cost. Highly recommended. GR/TR

(22) ENERGY FOR THE 80'S. Modern Talking Picture Service, Film Scheduling Center, 5000 Park Street North, St. Petersburg, FL 33709. (16 mm film, 28 minutes, free on loan)

As a case study of what one major energy company (Exxon Corporation) is undertaking to produce more oil and gas and develop alternative sources, this film succeeds. Excellent footage of oceanic exploration and oil extraction in the North and South China Seas is

provided. Secondary and tertiary recovery techniques are also described. The potential for fission, solar, fusion, and synfuels is discussed in the latter third of the presentation. This film might best be used to show high school students the way in which many companies are now approaching our energy problems, challenging pupils to create alternative strategies. GR

(23) ENERGY FUTURE: REPORT OF THE ENERGY PROJECT AT THE HARVARD BUSINESS SCHOOL. Third Edition. Edited by Robert Stobaugh and Daniel Yergin. Vintage Books. 400 Hahn Road, Westminster, MD 21157. (459 page book, $6.95)

The controversial classic of the new energy era, Energy Future appeared recently in its third edition, with updated information on Reagan energy policy. Some salient comments excerpted from various chapters: "Americans should not delude themselves into thinking that there is some huge hidden reservoir of domestic oil." "Too much too soon has been expected from coal." "We believe that serious efforts should be made in the early and mid-1980's to sustain the nuclear option." "The United States might use 30% less energy than it does, with virtually no penalty to the way Americans live." "Solar America...deserves a fair chance." "The fundamental purpose of U.S. energy policy...should be to manage a transition from a world of cheap imported oil to a more balanced system of energy sources." "What is still missing is an energy policy." "Models can be extremely useful in the formulation of energy policy...But a model is not reality."

This book may be tough for students, but it's a must for teachers. TR

(24) ENERGY HISTORY OF THE UNITED STATES 1776-1976 and WHAT'S NEW? Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. (wall chart and user's manual, $5.50, Stock #052-010-00459-9)

Publicized as a "one page book," the three-foot by four-foot chart traces the history of energy discovery, transformation, use, and abuse through two centuries. The format allows one to compare developments within a given era or follow the influence of a certain form of energy through several decades. You may read the chart any way you wish, the number of revelations being almost infinite. In case you want more direction, a user's manual is provided, filled with possible strategies, suggestions for classroom use, and more information. Spend a day with it. It can be used in diverse educational settings. GR

(25) ENERGY INSIDER. U.S. Department of Energy. Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. (newspaper, $17/year subscription, $2 single copy)

Published monthly by the U.S. Department of Energy, this periodical is free to libraries and some schools, and is available to the public by subscription. It contains a wealth of information concerning government's energy policy and developments. Most appropriate for a

discussion of current events in the field in a secondary science classroom. TR

(26) ENERGY MOBILE. New York State Energy Office, Office of Communications, 2 Rockefeller Plaza, Albany, NY 12223. (kit including cut-outs and a 10 page teacher's guide)

Developed by the State Energy Office, the Energy Mobile is an arts and crafts learning project for students in grades K-4. The Mobile is designed to introduce the topic of energy to young students and acquaint them with various sources of energy. The Energy Mobile Kit includes cut-out symbols representing each energy source -- wind, wood, coal, natural gas, oil, solar, nuclear, and energy from the ocean -- and a 10-page booklet, Teacher's Guide to the Energy Mobile, which provides teachers with background information on the energy sources and a suggested procedure.

To obtain the kit, write to "Energy Mobile" at the above address. Include your school name and address, along with the grade(s) and number of students you teach. SR

(27) ENERGY PACKET. Massachusetts Audubon Society, Lincoln, MA 01773. (portfolio containing magazines, reprints, and bibliographies, $5.00)

This packet contains seven past issues of The Curious Naturalist which focus exclusively upon energy sources, be they nuclear, geothermal, solar, or chemical forms. Each magazine provides lucid accounts with many photos, charts, and diagrams. Project suggestions are also included. In addition, the packet contains four teacher sheets concerned with energy and several bibliographies and public service information flyers. The wealth of information for both student and teacher reference more than justifies the packet's expense. GR/TR

(28) ENERGY POSTER CONTEST. Contact the New York State Energy Office, 2 Rockefeller Plaza, Albany, NY 12223.

Each year the New York State Energy Office sponsors an energy poster contest for schools within the state. A local committee of judges is established and sends winning entries on to Albany for further consideration. Request information from the NYSEO and use the contest to focus elementary, middle, and high school youngsters on the energy crisis and its solutions. TR

(29) THE ENERGY PUZZLE: HOW YOU FIT IN. Alliance to Save Energy, 1925 K Street, N.W., Washington, D.C. 20006. (41 page booklet)

Using a zippy, magazine-style format, The Energy Puzzle pushes for an energy conservation lifestyle and serious consideration of energy alternatives. Opening articles give serious analyses of the causes behind recent energy trends. Success stories of government, industry, and individual consumers are featured. Upbeat, but not childish, this is appropriate for grades 10-12. SR

(30) ENERGY REVIEW. New York State Energy Research & Development Authority, Department of Communications, Two Rockefeller Plaza, Albany, NY 12223. (newsletter, published quarterly)

This quarterly newsletter provides up-to-date information on selected research and development programs undertaken at ERDA. TR

(31) ENERGY SECURITY FOR THE UNITED STATES: PROGRESS, PITFALLS, POTENTIAL. American Petroleum Institute, Educational Services, 2101 L Street, N.W., Washington, D.C. 20037. (42 page booklet, 5 page flyer)

This report and its brief summarizing pamphlet review the progress in addressing U.S. energy problems in the early 1980s. An emphasis is placed upon past, present, and future public policy decisions which impact significantly upon achieving energy-related goals. The booklet concludes that governmental policies in the 1960s and 1970s were largely harmful and helped to intensify the crisis in energy supply brought on by the Arab Oil Embargo and Iranian Revolution. However, since the governmental price and allocation controls upon crude oil have been removed, domestic exploration and production has increased, significantly reducing the nation's reliance upon imported petroleum. While the text retains considerable optimism concerning America's increasing energy independence, several situations are viewed as threatening continued progress. The price controls upon natural gas, unnecessarily stringent environmental laws, and industry-specific taxes, including the windfall profit tax, are said to dampen incentive for discovery and development of fossil fuel resources. Increased leasing of government lands to private concerns is suggested, as is the development of a larger Strategic Petroleum Reserve. While infrequently admitting that the U.S. supplies of oil and natural gas are finite, the two pieces stress the importance of freeing the industry from restrictive policies which interfere with future exploitation of our proven and projected fuel reserves. Very little attention is given to alternative energy sources, which are seen as potentially important yet still in their infancy.

Overall, the scenario provided is one biased in favor of intense fossil fuel development to meet our immediate needs. Implicit in this orientation is the belief that a free market will encourage necessary conservation and best determine the appropriate course to take. Teachers and students will find these materials follow a "hard path" to presumed energy independence. Due to the sophistication of the documents, they might best be used by senior high school upperclassmen as reference material in preparing reports and debates. Students should be made aware that the views expressed are challenged in many other quarters of American society. CR/TR

(32) ENERGY SOURCE ENERGY EDUCATION PROGRAM. The Energy Source Program, 5505 E. Carson Street, Suite 250, Lakewood, CA 90713. (K-12 curriculum project)

This project is clearly one of the most ambitious ones completed in energy education thus far. Initiated by a group of educators and industry representatives, an articulated program has been developed, field-tested, and well received by the educational community. The instructional kits are multimedial, with filmstrips, cassette tapes, pre- and post-tests, student books, and teacher guides. Each kit has sufficient materials for ten lessons which might be spread over 2-3 weeks. Brief descriptions of the resources follow:

OFFALOT (Kindergarten, $30 per set): This kit comes with a furry puppet who turns things "off a lot." With Offalot, story cards, and the booklets, children recognize home energy uses and identify energy conservation practices and safety procedures.

BRIGHTLAND (Grade 1 or 2, $32 per set): This kit helps students understand how electricity and fuels are distributed to homes; what objects use gas, oil, gasoline, or electric power; and the kind of energy (heat, light, or motion) an energy user itself makes while operating. The filmstrip is entertaining.

FOSSIL FUEL JUNCTION (Grade 3 or 4, $32 per set): A classic western showdown between energy conservers and energy wasters begins this unit. Students learn about the nature, extraction, distribution, and uses of fossil fuels. After identifying fossil fuel products, youngsters plan conservation practices to follow.

POWER SWITCH (Grade 5 or 6, $35 per set): This kit provides an historical perspective on our use of wood, coal, and oil in the past century. Students examine lifestyles in each of the "fuel eras," the advantages and disadvantages of the present-day energy resource mix, new alternative power sources, and ways to conserve energy at home, work, and in the car.

ENERGY CRUNCH (Junior High Science, $24 for teacher pack, $56 for student materials): This kit explores energy from an economic perspective. Following an orientation to basic energy terms and concepts, students identify the gap between energy supply and demand. An analysis of conservation strategies and of present and future sources to fill the gap is encouraged. This unit is a very comprehensive one.

ENERGY IN AMERICAN HISTORY (Junior High Social Studies, $24 for teacher pack, $56 for student materials): Exploring energy from a historical perspective, this kit helps students identify trends in the growth of energy consumption and changes in America's fuel mix over the last 200 years. Alterations in lifestyles, energy-related inventions and discoveries, and the present energy dilemma are also investigated.

ENERGY CHOICES AND CHALLENGES (Senior High Science or Social Science, contact Energy Source Program for price): This three-week unit contains a teacher's guide, two sound filmstrips, pre- and post-tests, and two student booklets that form the unit's

core. The Energy Choices and Challenges booklet provides basic information concerning the energy gap, present sources, future technologies, electrical demand growth, and conservation strategies. The Energy Issues of the 80's booklet has students examine eight energy issues facing the nation, including offshore oil drilling, natural gas price controls, acid rain, radioactive waste disposal, and energy for the needy. Students are encouraged to form their own opinions on these issues.

The Energy Source curriculum represents an unbiased, attractively packaged program in energy education. While not inexpensive to install in a district, schools may request utilities and other companies to sponsor the program. This kind of association has been the primary mode of dissemination for this project. GR

(33) ENERGY TECHNOLOGY CHART. Conservation Consultants, 417 Thorn Street, Sewickley, PA 15143. (wall chart, $4.50)

This eye-catching chart is filled with colorful diagrams and discussions pertaining to many energy topics. Panels are devoted to the nature and forms of energy, ten energy resources, energy transmission and storage technologies, and patterns of energy conversion and use. Secondary students will find that a close reading provides a fine overview. SR

(34) ENERGY UNITS: HERTZ, JOULE, NEWTON, PASCAL, VOLT, WATT. National Science Teachers Association, 1742 Connecticut Avenue, N.W., Washington, D.C. 20009. (six posters, $10.00 and $2.00 shipping)

Each of the above energy units has been named in honor of an outstanding scientist. On the back of each colorful poster there is a brief description of the scientist's life and a discussion of the unit and its relationship to other measurements. A chart listing concrete examples of various unit magnitudes is a very welcome addition. These posters would be most suited to a high school science classroom. SR

(35) IN SEARCH OF ENERGY, by Alexander Taffel. National Energy Foundation, 366 Madison Avenue, New York, NY 10017. (94 page student text with teacher's guide. $2.97 as of 8/83 but subject to change. Contact NEF for current price.)

This project provides an excellent and current introduction to the topic for secondary students. The text is divided into nine units which, in a question-answer format, discuss the fundamental problems, the nature of energy, non-renewable sources, renewable sources, energy conservation, economic principles of production and use, the politics of energy, the risks and benefits of energy development, and future energy planning. Dr. Taffel's clear, terse, and informative style of writing will appeal to bright middle school youngsters and most high school students. Supplemented by well-chosen cartoons and diagrams, this highly readable book is one of the best introductions to the subject around. The teacher's guide provides a short test for each unit of the text and a pre-post test pertaining to the entire volume. An answer key is also

included. The guide also contains twenty-five lesson plans which correspond to most sections of the text. Each lesson poses a question, indicates materials needed, sets objectives, provides a motivating demonstration, and develops a sequence of ideas through questions, answers, and suggested activities. Conclusions and supplementary activities complete each lesson. Together, these plans could be used independently of or in concert with the other materials. The busy science and social studies teacher will find this program appropriate for a semester-long minicourse on energy or as a source of lessons that can be infused at strategic points into more traditional courses of study. While advanced physical science or economics students will find the text less challenging, even they should appreciate the concise and accurate overview provided. SR

(36) INTERDISCIPLINARY STUDENT/TEACHER MATERIALS ON ENERGY, THE ENVIRONMENT, AND THE ECONOMY. U.S. Department of Energy, Technical Information Center, P.O. Box 62, Oak Ridge, TN 37830. (complete instructional packets with teacher and student materials included)

The U.S. Department of Energy in cooperation with the National Science Teachers Association has developed classroom instructional materials concerning many facets of energy. Interdisciplinary in character, the packets are very well organized and self-contained.

ENERGY, ENGINES, AND THE INDUSTRIAL REVOLUTION (Grades 8, 9) introduces students to the roles that energy sources played in the industrial growth of England and America. The units encourage reading, writing, experimenting, interpretation of graphs and maps, and emphasize the invention and development of the steam engine.

HOW A BILL BECOMES A LAW TO CONSERVE ENERGY (Grades 9, 11, 12) engages high school students in the legislative process employed in the passage of the 55 mph speed limit bill into law. Through a simulation of a congressional hearing and data analysis, students become more familiar with the law's saving of human lives and environmental quality, as well as energy.

MATHEMATICS IN ENERGY (Grades 8, 9) will help middle school youngsters review and learn basic mathematical operations pertaining to fractions, decimals, percents, graphs, and energy units as they solve a host of energy-related problems.

AGRICULTURE, ENERGY, AND SOCIETY (Grades 10, 11, 12) causes advanced secondary students to review the sources of energy other than the sun which are important to food production. Fossil fuels expended for cultivation, food processing, production of fertilizers and pesticides, and crop drying are investigated.

ENERGY AND TRANSPORTATION (Grade 3) introduces middle elementary school students to the energy demands of past, present, and future modes of transportation through a variety of pictures, charts, and concrete activities.

NETWORKS: HOW ENERGY LINKS PEOPLE, GOODS, AND SERVICES (Grades 4, 5) acquaints late elementary students with the concept of a network through a very comprehensive introduction to the nature, production, distribution, and use of electricity within a community. This packet contains some fine hands-on experiences involving electrical circuits and is very well illustrated.

THE ENERGY DOME SOCIAL STUDIES PACKET (Grades 4, 5, 6), also directed toward upper elementary youngsters, teaches concepts of energy source, production, and distribution through the creative analysis of the needs of a modern domed stadium. Conservation and alternative sources are also considered. Children will enjoy the activities and thematic approach of this packet.

THE ENERGY FUTURE TODAY (Grades 7, 8, 9 - Social Studies) leads secondary students to a more sophisticated understanding of our energy dilemmas, scarcities, tradeoffs, and short and long term options. The activities stress classification, inference from written and graphic material, role playing, and decision-making.

Collectively these packets serve as excellent resources which the local energy educator will wish to consider for use in several different subject areas. GR

(37) THE KINGDOM OF MOCHA. Modern Talking Picture Services, Film Scheduling Center, 5000 Park Street North, St. Petersburg, FL 33709. (16 mm film, 26 minutes, free on loan)

Few Americans have good insights into the complexities of the nation's free market economy and its interaction with the growing energy shortages. Through an analysis of the economic development of a mythical island, junior and senior high students are introduced to economic concepts in an entertaining yet informative manner. The impact of a wood shortage on other aspects of Mocha's economy provides clues for understanding the consequences of oil and gas depletion in the United States. Teachers may wish to purchase ($1.00 each) the accompanying teacher's guide (The Mochans: order from Amoco Teaching Aids, P.O. Box 1400K, Dayton, OH 45414) which contains suggested lesson plans, class activities, and ten duplicating masters which illustrate key concepts of the film and include pre- and post-tests. Strategic use of these resources will insure that students view the energy crisis in a more comprehensive context. SR

(38) LIVING WITH ENERGY. Amoco Teaching Aids, P.O. Box 1400 K, Dayton, OH 45414. (one file folder containing 5 spirit masters, 50¢)

These materials raise the consciousness of middle and high school students toward the conflicts that arise while adjusting personal

and community lifestyles to increasing energy shortages. Group problem solving is encouraged in several of the activity masters and teachers should structure the use of these exercises to best fit students' needs. The lessons, while somewhat dated, provide insight into the complexities of the present challenge. GR

(39) LIVING WITHIN OUR MEANS: ENERGY AND SCARCITY, ENVIRONMENTAL EDUCATION INSTRUCTIONAL ACTIVITIES K-6/7-12. Bureau of Curriculum Development, State Education Department, Albany, NY 12234. (2 books, free to New York State teachers)

Environmentally oriented, these interdisciplinary collections of student activities often include analyses of energy principles and resource conservation. Each activity is tied to an environmental understanding and gives direct instructions to the teacher, including questions to elicit discussion. Places in present New York State curricula in which to infuse the activities are noted. All teachers should have access to these helpful guides. GR

(40) LOOKING FOR ENERGY? A GUIDE TO INFORMATION RESOURCES. American Petroleum Institute, 2101 L Street, N.W., Washington, D.C. 20037. (36 page booklet, single copy free, bulk copies 25¢ each)

While far from being comprehensive, this is a fine reference for those wishing information on the following topics: Careers, Coal, Conservation, Economics and Energy, Electricity, Energy (General), Energy Education, Environment, Natural Gas, Nuclear, Petroleum, Renewable Energy Sources, and Synthetic Fuels. Forty-seven individuals, private associations, or federal agencies have their material so categorized. Items cited are annotated and many are free of charge or of nominal expense. There should be something herein for any teacher. TR

(41) MOVIES ABOUT ENERGY. 1983 Edition. American Petroleum Institute, Public Relations Department, Photographic and Film Services, 2101 L Street, N.W., Washington, D.C. 20037. (single copies free, additional copies 75¢ each)

A catalog listing energy-related films. Contains more than 550 entries. TR

(42) NEW YORK STATE ENERGY. New York State Energy Office, Office of Communications, 2 Rockefeller Plaza, Albany, NY 12223. (16 page booklet)

This booklet provides an overview of New York's energy picture, including the State Energy Master Plan, Conservation, Renewable Resources, Coal, Natural Gas, and Electric Power. TR

(43) NEW YORK STATE ENERGY MASTER PLAN & LONG-RANGE ELECTRIC & GAS REPORT. EXECUTIVE SUMMARY. New York State Energy Office, 2 Rockefeller Plaza, Albany, NY 12223. (12 page booklet)

As energy issues are raised with secondary youngsters, teachers should be ready for the likely question, "So what is the state doing about our problems?" This booklet provides the answer. Subsequent to a profile of New York State energy consumption, the state's policies formulated to reduce its dependence upon imported petroleum are listed. Recommendations of the updated Energy Master Plan regarding conservation, renewable resources, natural gas, electricity, coal, petroleum, and transportation are also provided. Well illustrated with charts, graphs, and tables, this is a fine update for educators. TR

(44) NSTA ENERGY-ENVIRONMENT SOURCE BOOK. National Science Teachers Association, 1742 Connecticut Avenue, N.W., Washington, D.C. 20009. (279 page book, $9 per copy and $2 shipping)

This resource is a "must" for serious inquiry. The Source Book is readable and comprehensive in its approach to energy facts and issues. It is profusely illustrated with charts and tables, and a glossary and technical appendices are included. GR

(45) ODYSSEY: A QUEST FOR ENERGY. Modern Talking Picture Service, Film Scheduling Center, 5000 Park Street North, St. Petersburg, FL 33709. (16 mm film, 28 minutes, free on loan)

Responsible choice among America's energy options for future energy security is the theme of this recent film. While projections for the further development of conventional, synthetic, and renewable sources are provided, solar heating and wind power are virtually ignored. However, high school students should find this well-produced film quite interesting. A teacher's guide is included. GR

(46) PERSPECTIVES ON ENERGY: ISSUES, IDEAS, AND ENVIRONMENTAL DILEMMAS, edited by Lon C. Ruedisili and Morris W. Firebaugh. Oxford University Press, 16-00 Pollitt Drive, Fair Lawn, NJ 07410. (511 page paperback volume, $11.95)

This book is one of the finer texts presently available on all aspects of energy. It could be successfully used as a text in high school elective courses in energy education, and as an important teacher reference as well. The editors have succeeded in collecting well-written and authoritative articles that fall within the following sections: Background and Limitations; Fossil Fuel Energy Sources; Nuclear Fission as an Energy Source; Alternative Energy Sources; and Conservation, Lifestyles, and Energy Policy for the Future. This volume is well worth its price. TR/GR

(47) PLAYING WITH ENERGY: CLASSROOM GAMES & SIMULATIONS. National Science Teachers Association, 1742 Connecticut Avenue, N.W., Washington, D.C. 20009. (106 page book, $5.00 and $2.00 shipping)

Science education in the 1980s will stress process skills and decision-making while focusing upon issues that are technological, transdisciplinary, and even ethical. This resource is an excellent

example of what hopefully will characterize science curricula in the near future. Five games and simulations for high school students are included and each has been teacher-written and classroom-tested. While these activities will perhaps appeal most to the science teacher, they pose questions and problems involving other disciplines as well.

Introductions to each game are provided, with instructional objectives, and notes for teacher preparation and wrap-up. Each game is self-contained with a title sheet and rules and procedures. Science themes and science process skills engaged in playing the game are described. Very important to gleaning the most value from each game is the review sheet, designed to provoke student analysis, evaluation, and decision-making.

The games and simulations tend to stress alternative energy resources and imply that there are alternatives to continued reliance upon fossil fuels. "Energy Paths" exemplifies this perspective by having students move through "hard" and "soft" energy strategies as each tries to reduce U.S. foreign oil dependency as quickly as possible. "Consultants, Inc." simulates a power company's Board of Directors' decision-making process as it reviews proposals for a new electrical generating plant powered by a renewable form of energy. "Selling Energy" is also a simulation where student groups research, develop, and present advertisements for energy-related products. A striking revelation of this activity is the contrast between a product's actual scientific value and the way in which this value is distorted through advertising. In "Canmexus," student pairs representing Canada, Mexico, and the United States attempt to attain or exceed their goals for national energy production, and learn through playing about the cost/benefit ratios of resource utilization and the value of increasing international interdependence. Finally, "CO_2 and Climate" is a board game which continues the theme of global cooperation as five student groups representing world regions attempt to free themselves from reliance upon fossil fuels and the dire climatic consequences of their use.

In every way, this book is easily worth its price and a source of much learning and fun in any high school science classroom. GR

(48) SCIENCE ACTIVITIES IN ENERGY. U. S. Department of Energy, Technical Information Center, P.O. Box 62, Oak Ridge, TN 37830. (7 file folder packets, each with 11-16 activity sheets)

Developed by the Oak Ridge Associated Universities for DOE, each folder contains simple exercises and experiments which lead 4th through 10th graders to first-hand understandings of basic principles and problems related to various forms of energy and their development, use, and conservation. Materials required are usually inexpensive and readily available. Beginning with a question, each activity sheet graphically directs the inquiry to its conclusion with additional ideas included for further exploration. The loose sheets arrangement encourages duplication and facilitates their display. Several of the folders have supplemental information and suggestions pertaining to the activities. All measurements are metric. Individual folder descriptions follow:

BIOMASS: Activities focus upon plant growth; the effects of light, fertilizer, and gibberellin upon biomass development; and the relative heat energies of vegetable oil, peanuts, and green or dry wood. A teacher's guide is included. Best used in upper elementary grades.

CHEMICAL ENERGY: Activities include comparisons of fuel energy contents, by-products of fuel consumption, photochemical requirements and reactions, and synthetic products of fossil fuels. For upper elementary grades.

CONSERVATION I: Concentrating on personal energy use, activities involve home ventilation and school heat loss, simple thermostats, insulation and differential color absorption, conserving hot water, and efficiency in transportation. Designed for fourth, fifth, and sixth graders.

CONSERVATION II: Experiments explore automotive forces, R-values, insulation, light bulb illumination and efficiency, recycling, hot water conservation, and the economics involved in the use of electronic batteries. These activities have been created for high school students and come with a teacher's guide. Some of the electrical connections diagramed are unsafe and the teacher should show caution.

ELECTRICAL ENERGY: Investigations in this unit emphasize how electricity is manufactured; the use of electricity for motors, electrolysis, electroplating, and lighting; and electrical measurement. Designed for upper elementary students.

ENERGY STORAGE: Activities in this packet acquaint the middle school student with various storage forms for energy; including gravitational potential energy, chemical bond energy, and the energy in compressed air, batteries, and flywheels. A teacher's guide is included.

WIND ENERGY: Several interesting exercises comprise this unit: measuring wind speeds, designing an effective sailboat, comparing electric capacities of propellers of different sizes and angles, designing gliders and kites, and contrasting the performance of modern wind machines. Most appropriate for middle schoolers.

These folders are filled with concrete, enlightening investigations which can be performed by the entire class, groups of pupils, or by individual youngsters in project work. Colorful, attractive, and flexible resources; free for the asking! S:

(49) SCIENCE CHALLENGE. Curriculum Innovations, Inc., 3500 Western Avenue, Highland Park, IL 60035. (published monthly during the school year, $4.75/student, minimum order: 15 subscriptions)

Incorporating the former Current Energy and Ecology, Science Challenge follows the typical student magazine format: a mix of information, controversy, education, and fun. The teacher will want to develop follow-up exercises (comprehension questions, vocabulary, etc.), but the magazine does provide a teacher's guide and a good variety of features (energy debates, science careers, computer information, current events). This is a worthwhile investment for the serious energy educator at the junior high level. SR

(50) A SHORT ENERGY HISTORY OF THE UNITED STATES...AND SOME THOUGHTS ABOUT THE FUTURE, by Joseph M. Dukert. Edison Electric Institute, 1111 19th Street, N.W., Washington, D.C. 20036. (85 page book, $2.50)

Part of the Edison Electric's "Decisionmaker's Bookshelf" this 85-page book is provocatively written and rather value-laden. However, it's a good starting point for research by the teacher or advanced student. TR

(51) STUDENT ENERGY RESEARCH COMPETITION AND ENERGY FAIR. New York State Energy Research & Development Authority, Department of Communications, Two Rockefeller Plaza, Albany, NY 12223.

Co-sponsored by NYSERDA and the State Energy Office, this 2-phase competition enables all New York State students in grades 9-12 to design and execute science projects addressing the State's energy needs. In Round I students submit project proposals and compete for research awards of up to $500 to execute their projects. Round II consists of a 2-day Energy Fair where winning first round projects are exhibited and judged. Final winners in each of 5 categories: Research/Experimental; Demonstration; Design; Analytical Modeling; and Energy Conservation in Schools receive cash awards. GR

(52) TWO ENERGY FUTURES: A NATIONAL CHOICE FOR THE 80s. American Petroleum Institute, Educational Services, 2101 L Street, N.W., Washington, DC 20037. (196 page book; first 10 copies free, additional copies $2.50 each)

Will the United States slip back into overdependence upon imported oil or continue to increase its level of energy security through conservation and domestic development? This book is based on the premise that we can achieve even greater independence with "improved government policies." These policies reportedly could maintain U.S. gas and oil production at 1979 levels, double the use of coal, triple the contribution of nuclear power, and secure new energy production from synthetic fuels and renewable sources, all by 1990. Much of the volume is devoted to a documentation of source supplies, past and present impediments to development, and future projections and needs. Necessary governmental policy changes, such as decontrol of natural gas production and greater access to government lands, are stressed throughout the document.

While the points of view are clearly ones that favor the interests of fossil-fuel based industries, the content and organization of the book are impressive and informative. Teachers of high school energy electives and units will find this a useful reference, even though they are likely to question many of its assertions. TR

(53) WHAT CAN YOU MAKE FROM ENERGY? Union Carbide Corporation, P.O. Box 14325, Dayton, OH 45414. (a booklet of 12 spirit masters with a teacher's guide, $2.00)

The conversion of oil into petrochemicals to provide a multitude of synthetic goods is a topic seldom addressed in energy education resources. This program helps to fill the need by presenting twelve lessons, each structured around a spirit duplicating master which should provide 200 clear copies for student use. The first five lessons stress energy use, transformations, world fossil fuel resources, and alternative sources. The next four lessons zero in on the technical developments in the past century that have led to our heavy reliance upon petrochemicals today. As with the preceding lessons, most activities involve reading and answering questions, although one lesson encourages student experimental analysis of products derived from ammonia, methane, ethylene, propylene, and butylene. The last three lessons sensitize students to the importance of the petrochemical industry as a source of jobs and raw materials, describe environmental implications, and ask students to rank and discuss future energy management policies which seem appropriate. A double-sided wall chart and pre-post test are also included. The 8-page teacher's guide includes each lesson's objectives, instructions for using the activity master in the classroom, and ideas for extending the lesson as desired.

This is certainly a well-organized resource convenient for teacher use. Intended for middle school students, much of it could be of value in high school introductory physical science courses. While the emphasis is on fossil fuels, the materials are reasonably objective. The argument that we must conserve oil, gas, and coal for use in making vital petrochemicals seems well advised. GR

(54) YOUR ENERGY WORLD. Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. (Four file folders, each filled with spirit duplicating masters; two-sided wall chart, $8.00, Stock #061-000-00440-8)

The busy upper elementary and middle school teacher will appreciate these ready-for-use curriculum materials. Your Energy World consists of four units, each taking three to five classroom periods to complete in addition to home and community assignments. The first unit, "Energy Overview," introduces students to various energy sources, fossil fuels, electrical usage, and current problems through the use of spirit masters which contain non-duplicating teacher directions and correct responses. As in all the units, instructions for employing each activity master are provided on the folder along with suggested additional activities.

The three other units emphasize saving energy through conservation and can be used independently or in conjunction with the overview unit. "Transportation: The Energy Eater" makes students aware of the energy consumption of transporters and of the strategies which can effectively reduce such use in their families and community. "Energy Use in Homes and Stores" involves children in exploring insulation savings, electrical reliance in the home, the energy requirements of food processing, and an assessment of domestic measures to conserve heat and power. A simulation asks students to role-play in a series of school board meetings which focus their attention upon institutional energy allocations and ways to increase the efficiency of school operations in "Schools Can Conserve Too." A two-sided wall chart is included which describes present and future energy resources and gives tips for energy conservation. Collectively this resource is an attractive project which should be well received by both students and their teachers. SR

P·O·W·E·R B·Y T·H·E H·O·U·R

Electricity

A clean, convenient, continuous source of power, electricity may well be the first word which Americans associate with energy. Yet few understand the means by which electricity is generated, transmitted, distributed, and transformed for use in our homes, businesses, and industries. Electrical energy consumption is growing at a faster rate than total energy consumption each year. It is vital that young people become aware of the facts and trends associated with the use of electricity, and of the substantial savings in fossil fuel which could result from wise restraint combined with more ambitious development of alternative means of generating electrical power. The materials below will facilitate such awareness.

(55) ANNAPOLIS STRAFLO TURBINE WILL DEMONSTRATE BAY OF FUNDY TIDAL POWER CONCEPT. Nova Scotia Power Corporation, P.O. Box 238, Annapolis Royal, NS BOS 1A0. Attn: Dick Giddens, Resident Engineer. (8 page pamphlet)

The concept of exploiting the Bay of Fundy tides to generate electricity has held the interest of the utility industry since World War II. A fairly recent study found several sites where projects would be technically feasible but not cost competitive. Current economic conditions have again made tidal power look attractive and a $46 million, 20 MW pilot project is near completion at Annapolis Royal, Nova Scotia. This pamphlet describes the new turbine-generator assembly, project site, construction schedule, and installation and operation of equipment. The Bay of Fundy studies and site parameters are also included. Many maps, figures, and tables supplement the text. Since this piece is somewhat technical, it would be most appropriate as a teacher reference. TR

(56) CONSUMER'S GUIDE TO UTILITY COMPANIES IN NEW YORK STATE (IB-154). Distribution Center, Cornell University, 7 Research Park, Ithaca, NY 14850. (16 page booklet, $1.25)

Most youngsters and even adults take their telephone, electrical, and gas services for granted. However, over sixty utility companies provide these services in New York State and possess sophisticated distribution and rate schedules. This booklet provides important information concerning the computation of telephone, electrical, and gas bills, including suggestions for cutting costs and information on reading home meters. The rights of the consumer are stressed throughout, especially in regard to termination of service or delinquency in payments. High school students will find this a helpful reference in preparing reports. SR

(57) ELECTRICITY: TODAY'S TECHNOLOGIES, TOMORROW'S ALTERNATIVES. Revised edition. Electric Power Research Insti-

tute. Distributed by William Kaufmann, Inc., 95 First Street, Los Altos, CA 94022. (104 page book, $7.95)

This book is a concisely written introduction to electrical demand, generation, and supply. Subsequent to a discussion of the principles of electric power production, the book outlines present and future generating options, summarizes the elements involved in storing and delivering electricity, and addresses environmental concerns and future policy. The treatment is both comprehensive and informative. Illustrations support the text nicely. A good up-to-date reference for teachers and advanced secondary students. SR/TR

(58) ENERGY REPORTERS. Electric Power Research Institute, Research Reports Center, P.O. Box 50490, Palo Alto, CA 94303. (each topic can be obtained in a classroom set of 35 student copies and 1 teacher's guide for $7.50/set)

The Electric Power Research Institute, a nonprofit research and development organization funded by America's electric utilities, offers an ongoing series of pamphlets providing information on energy technologies related to electrical power generation. Each student reader is a four page pamphlet, concisely written and summarized, including questions and a vocabulary list. The supplemental teacher's guide for each reader provides suggestions for discussion activities, answers to the questions noted above, related readings, and audiovisual resources. Brief descriptions of several titles follow:

ELECTRICITY: OVERVIEW OF A VERSATILE ENERGY describes the production, measurement, and distribution of electricity and discusses the various types of electric utilities and the challenges facing them.

ELECTRICITY FROM COAL: STILL A RELIABLE FUEL discusses coal bed creation, the combustion of coal to produce electricity, and the promising technologies of coal gasification and liquefaction. Considerable attention is given to solid and gaseous waste treatment and control.

ELECTRICITY FROM NUCLEAR FISSION: SPLITTING THE ATOM provides a summary of the nuclear fuel cycle, the primary types of reactors, and the basic problems of nuclear power production.

THE ELECTRIC VEHICLE: TECHNOLOGY AT THE CROSSROADS presents an interesting look at the history, present-day uses, and future of electric vehicles. The problems of inefficient battery systems, lack of mass production centers, and lack of recharging systems are also discussed. Many of the potential "solutions" are intriguing.

ELECTRICITY FROM THE EARTH: GEOTHERMAL ENERGY describes the three broad categories of geothermal energy: hydrothermal systems, geopressured systems, and petrothermal systems. The nature of each system is discussed along with its method of exploitation and relative merits.

ELECTRICITY FROM WIND: NEW USE OF AN OLD SOURCE provides a fine summary of past uses of wind power, wind origins, wind turbine designs and potential sites, and economic prospects.

ELECTRICITY FROM THE SUN: TECHNOLOGY FOR SOLAR POWER focuses upon solar-thermal conversions and photovoltaic energy conversion, describing the technical processes and applications in some detail.

ELECTRICITY FROM NUCLEAR FUSION: THE PROMISE AND THE CHALLENGE introduces the reader to the fundamentals of fusion technology while highlighting the serious difficulties yet to be fully overcome.

Other titles pertaining to fuel cells, hydroelectric power, and electrical transmission and distribution also exist. Collectively, these pamphlets are appropriate readers for high school students. The topics can be used flexibly in standard courses or in energy education electives. In all, the emphasis is upon serving our electrical power needs. SR/TR

(59) 104 WAYS TO CONTROL YOUR ELECTRIC BILL. (12 page booklet)

ELECTRICITY AND THE ENVIRONMENT: ANSWERS TO YOUR QUESTIONS. (56 page booklet)

RATES: ANSWERS TO YOUR QUESTIONS. (31 page booklet)

YOU AND YOUR ELECTRIC COMPANY. (37 page booklet)

Edison Electric Institute, 1111 19th Street, N.W., Washington, D.C. 20036.

This national association of electric companies provides reference materials concerning electrical sources and technologies. 104 Ways to Control Your Electric Bill suggests opportunities to lower home electrical consumption in the areas of heating, cooling, lighting, cooking, water heating, laundering, and refrigeration. The other three resources cited employ a question-answer format to discuss the following topics: the environmental implications of electric power production; electric rate design and regulation; and basic data relating to electrical generation and sources. These booklets address many issues, and would provide good reference material for high school debaters and teachers. While a clear point of view favoring the utilities emerges, the discussions are informative and quite responsible. GR

(60) RIVERS OF ENERGY: THE HYDROELECTRIC POTENTIAL, by Daniel Deudney. Worldwatch Paper 44, June 1981. Worldwatch Institute, 1776 Massachusetts Avenue, N.W., Washington, D.C. 20036. (56 page booklet, $2.00)

In this era of diminishing fossil fuels, nuclear power controversies, and novel technologies, it is easy to forget about an important and still very promising source of electricity - hydropower. This paper

stresses the hope that hydropower can offer in closing the energy gap, supporting the development of the Third World, and providing a non-polluting, dependable, and safe source of energy for future generations. The exploitation of remaining power sites will not be without economic and political problems, however, and Deudney provides model problems and solutions from the international scene. This booklet serves as a fine teacher and high school student reference. SR/TR

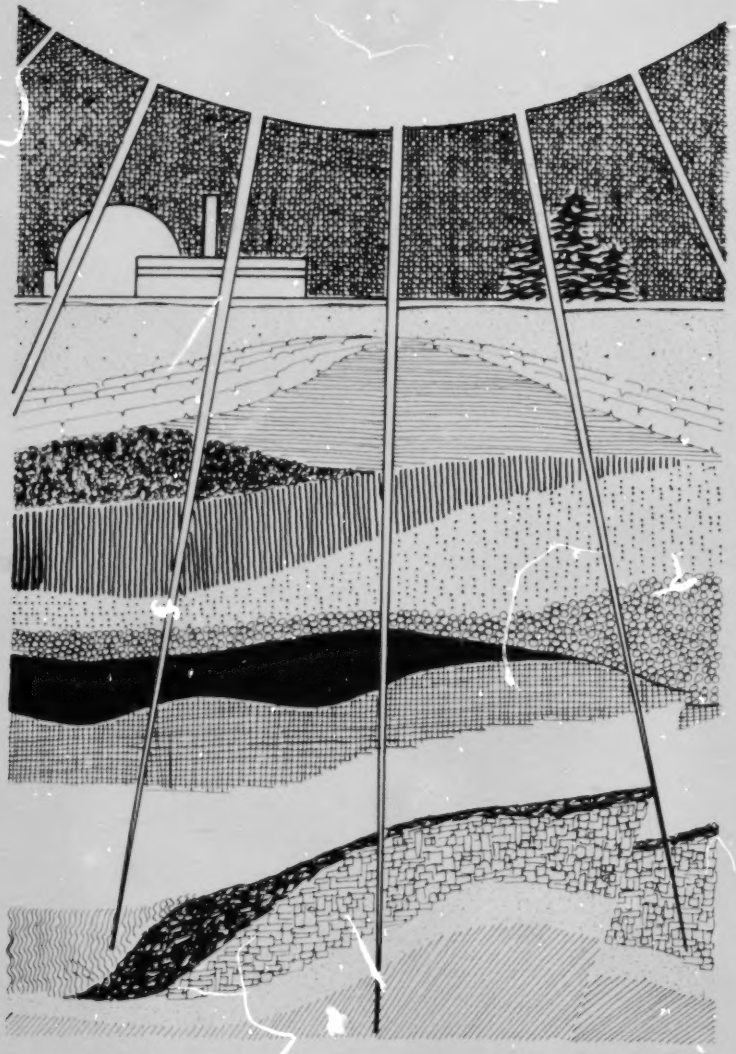
(61) SIMPLE EXPERIMENTS ON MAGNETISM AND ELECTRICITY. (32 page booklet)

SELECTED EXPERIMENTS AND PROJECTS. (32 page booklet)

USEFUL SCIENCE PROJECTS. (32 page booklet)

Charles Edison Fund, 101 South Harrison Street, East Orange, NJ 07018. (part of a $1.00 teaching kit which includes four other titles)

These booklets describe a variety of electrical devices, projects, demonstrations, and experiments which early secondary students should enjoy working on. An added advantage is that the needed materials are usually easily obtained. Youngsters will learn many electrical concepts as they construct galvanometers, portable burglar alarms, cigar-box microphones, and many other devices. Teachers should select those investigations that match their own instructional objectives. SR



C·I·R·C·U·I·T B·R·E·A·K·E·R·S

Nuclear and Fossil Fuels

Just a century ago, most of our country's energy came from wood. Since then, we have discovered and developed our coal, oil, and gas resources to the point where about 92 percent of our energy comes from these three fossil fuels. Fuel for heating, transportation, and electricity is provided by some six billion barrels of oil, 730 million tons of coal, and 20 trillion cubic feet of natural gas each year. We have used these sources as if supplies were inexhaustible, but reserves of gas and oil may be critically depleted in a few decades. Coal, in greatest supply, only accounts for 22 percent of present energy consumption. Uranium, the food for fission reactions, will also last only three or four decades at anticipated consumption rates. Clearly, continued reliance upon traditional fuels will soon break the energy circuit if we fail to plug into other sources, or continue to accept the dismal conversion efficiencies and recovery rates that now exist. The following items will clarify the role of fossil and nuclear fuels in our economy and hint at their potential contributions in the future.

Oil

(62) CATALYSTS AND CRUDE - THE STORY OF PETROLEUM REFINING. Amoco Educational Services, Public Affairs, Mail Code 3705, Post Office Box 5910-A, Chicago, IL 60680. (22 page booklet)

From the early alchemists, through the pioneer efforts of Samuel Downer, to present day achievements and challenges, this booklet traces the history and development of crude oil refining as an industry. The techniques of cracking, fractionating, catalytic reforming, alkylation, and treating and blending are explained in some detail. Products deriving from oil processing are described in the context of their use and mode of production. The booklet also addresses environmental concerns, and offers job descriptions of those who work in the production, maintenance, and engineering units of the refinery. This is a well-written and interesting piece that can be used as a teacher reference or high school student reader. SR/TR

(63) MIDDLE EAST OIL. (39 page booklet; September, 1980)

WORLD OIL INVENTORIES. (17 page booklet; August, 1981)

HOW MUCH OIL AND GAS? (17 page booklet; May, 1982)

IMPROVED OIL RECOVERY. (17 page booklet; December, 1982)

Exxon Company, U.S.A., Public Affairs Department, Communication Services, P.O. Box 2180, Houston, TX 77001.

These booklets are drawn from the Exxon Background Series and provide detailed examinations of the topics cited:

Middle East Oil is an excellent reference for both high school teachers and advanced students. Much of the booklet describes the history of petroleum exploration, development, and refining in each of the Middle Eastern countries, as well as in Egypt and Libya. Summarizing tables and charts provide a wealth of statistics in a comprehensible way. Discovery data, production data, existing oil fields, refining capacity, gas liquids capacity, industrialization projects, and selling prices are included in the information presented. The latter portion of the document describes the fundamental changes which took place in the relations between the oil-producing countries, international oil companies, and the consuming countries during the 1970s. The birth and growing influence of OPEC is charted, as are the dislocating price changes and their effects upon the Middle East and the world. While limited by its date of publication, this resource provides a fine summary of events taking place through 1980. SR/TR

World Oil Inventories describes the world and national oil distribution and storage system, a fairly unfamiliar subject to most people. A series of fine, colorful figures explicate a discussion of the composition of primary inventories ashore and afloat, both for the world and the United States. The booklet concludes with a presentation of factors influencing inventory levels, including supply, demand, inventory costs, and government strategic planning. This reference provides the teacher and advanced secondary student with a clear view of how the world's crude oil reaches the consumer and what factors limit the accuracy of oil supply assessments. This helpful resource will add light to discussions often based upon myth and misinformation. SR/TR

How Much Oil and Gas? is a concise discussion of the elements involved in estimating the discovered resources and undiscovered potential of the world's oil and gas supply. Methods of estimation are provided, and tables display the cumulative crude oil production, proved crude oil reserves, and proved natural gas reserves of leading countries. Future oil and gas discovery rates are also projected. Teachers and advanced secondary students will find this document a sobering reminder that fossil fuel resources are indeed finite and diminishing. SR/TR

Improved Oil Recovery focuses upon a set of technologies gaining in importance in crude oil production. The nature, efficiency, and limitations of primary and secondary recovery methods are discussed, with excellent supplemental tables and color figures provided. Enhanced oil recovery methods, including thermally enhanced, miscible, and chemically enhanced recovery techniques are described in some detail. Technical and economic considerations are also included. Teachers and advanced high school students who use this booklet as a reference may be surprised by how much oil is unrecoverable, despite the sophistication of the recovery methods. SR/TR

(64) MYTHS AND MISPERCEPTIONS: EXPLORING THE NEW WORLD OF ENERGY. American Petroleum Institute, Educational Services, 2101 L Street, N.W., Washington, D.C. 20037. (28 page booklet)

Prefacing each section by a similar myth from travelers' tales about the New World, this booklet describes ten common myths about the oil industry and explains why each is false. The Tanker Myth states that oil companies held oil in offshore tankers during gasoline shortages, waiting for prices to rise. The Hoarding Myth implies these same companies were concealing oil products, in other ways, to create shortages and drive up the price of oil. The Monopoly Myth says that a few major companies were engaged in collusion to "fix" prices and eliminate competition. The beliefs that oil companies enjoy exorbitant profits, have an infinite source of petroleum wealth, and suppress inventions which would lessen dependence on oil comprise three additional myths. The pamphlet moves on to say that some people believe that oil companies are exporting oil from Alaska's North Slope to Japan, despite laws prohibiting such activity. Myths that governmentally administered price controls and allocation plans are in the national interest are also explored. A final myth presented refers to the widespread belief that America will soon run out of oil and gas. As with the other myths addressed, this perception is shown to be at variance with the facts and recent national experience.

While this is an informative and interesting piece, the bias toward national fossil fuel production is obvious. Without contrasting data, the reader could be lulled into a belief that the oil companies are our exclusive "energy saviors." The best use of this document would be in an elective course in energy or economics where juniors or seniors in high school could analyze and debate the assertions presented. GR/TR

(65) OIL. Shell Film Library. Scheduling Center, 5000 Park Street, North, St. Petersburg, FL 33709. (16 mm film, 18 minutes, free for return postage)

This film surveys the oil industry, beginning with the formation and trapping of oil in sedimentary rock layers. The location of reservoirs through seismic research and subsequent drilling operations are shown for both onshore and offshore fields. Transport, refining, and manufacture of oil-based products are also discussed. A fine introductory movie for secondary students. SR

(66) OIL IN DEPTH -- THE STORY OF PETROLEUM EXPLORATION AND PRODUCTION. Amoco Educational Services, Public Affairs - MC 3705, P.O. Box 5910-A, Chicago, IL 60608. (31 page booklet)

Any teacher or upper secondary student interested in a detailed account of petroleum formation, exploration, development, and production will be richly rewarded by a reading of this authoritative and comprehensive booklet. The roles of the geologist, geophysicist, landman, driller, and producer are explained in detail and the newest technologies are described. Dozens of industry-related terms, from "geophone" and "light holes" to "drill string" and "drill ship" are vividly defined. A wealth of information for reference and study. GR/TR

(67) OIL WELL. Shell Film Library, Scheduling Center, 5000 Park Street North, St. Petersburg, FL 33709. (16 mm film, 21 minutes, free for return postage)

Through the excellent use of live and animated sequences, the principles of drilling an exploration well are described. Safety precautions and emergency measures are carefully presented. Final appraisal procedures for determining the dimensions of oil and gas reservoirs are shown. Appropriate for senior high school students. SR

(68) OPERATING THE TRANS ALASKA PIPELINE. Alyeska Pipeline Service Company, 1835 South Bragaw Street, Anchorage, AK 99512. (21 page booklet)

This booklet is packed with photos, charts, and diagrams to illustrate the operation of the pump stations, topping plants, refrigeration units, pipeline supports, control centers, and terminal that bring crude oil 800 miles across Alaska to the ice-free port of Valdez. While nontechnical, the discussion is quite specific and involved. Aspiring engineering students in senior high school will find this piece interesting, as will teachers wishing to explain more about the Alaskan Pipeline to their students. SR/TR

(69) PETROLEUM INDUSTRY CAREERS. Amoco Educational Services, Public Affairs - MC-3705, P.O. Box 5910-A, Chicago, IL 60680. (5 page pamphlet)

This brief piece lists many of the 3000 occupations in the petroleum industry, grouped according to the major processes of oil development, conversion, and use. A handy code indicates the training and experience required for each job listed. A helpful career education tool. SR

(70) PIPELINE ALASKA. The Standard Oil Company (Ohio), Film Library, 2515 Franklin Boulevard, Cleveland, OH 44113. (16 mm film, 29 minutes)

This film traces the construction of the trans-Alaska oil pipeline from the North Slope, near Prudhoe Bay to the ice-free port of Valdez, some 800 miles to the south. Some 70,000 lengths of pipe were laid across tundra, mountains, forests, and rivers in the costliest private enterprise in commercial history. Through spectacular views of scenery, wildlife, and pipeline building in both fine and dreadful weather, the viewer grows to appreciate the enormous technical triumph the pipeline's completion signified and the courage of those men and women who braved the cold and ice to enable America to tap its richest oil field. A fine film for secondary students. SR

(71) PUBLICATIONS AND MATERIALS. Updated yearly. American Petroleum Institute. Publications and Distribution Section, 2101 L Street, N.W. Washington, D.C. 20037. (booklet, single copies free)

A guide to hundreds of free and low-cost materials dealing with the marketing, production, refining, and transportation of oil. Sections on environmental affairs, statistics, public relations, and medicine are also included. Worth sending for if you plan to teach a detailed unit on oil. TR

(72) REFINERY. Modern Talking Picture Service, Film Scheduling Center, 5000 Park Street North, St. Petersburg, FL 33709. (16 mm film, 14½ minutes, free on loan)

Through fine and colorful animated sequences, this film describes several refinery processes, including fractional distillation, fluid catalytic cracking, alkylation, and catalytic reforming. Live footage supports the script as needed, emphasizing the functions of blending and water treatment. A good introduction for high school students. SR

(73) REFINING. The Standard Oil Company (Ohio), Film Library, 2515 Franklin Boulevard, Cleveland, OH 44113. (16 mm film, 18 minutes)

Breaking away from a stuffy guided tour of a refinery, a British cartoon figure explains the basic principles of refining crude oil, including separation, conversion, and purification of components. Techniques are discussed in understandable and rather humorous terms. Many of the uses to which petroleum may be put are also suggested. This film would be most well received in a middle school classroom. SR

(74) SEARCH FOR SURVIVAL: THE PETROLEUM EXPLORATION STORY. American Petroleum Institute, Publications and Distribution Section, 2101 L Street, N.W., Washington, D.C. 20037. (16 mm film, 22 minutes, free on loan)

Oil production is a "high risk" business and this is not always appreciated by either students or adults. This film traces oil exploration from its investigative stages employing seismic techniques, through the analysis of optimal lease sites, to the bidding for drilling rights. While nontechnical, the anecdotes of people in the industry along with the realistic footage give senior high students a taste of the adventure and the stakes involved. A good lead-in for a discussion about oil company myths and realities. GR

(75) THE STORY OF PETROLEUM. Shell Oil Company, Public Affairs, One Shell Plaza, P.O. Box 2463, Houston, TX 77001. (55 page booklet)

Placing all phases of the petroleum industry for discussion within one document is what makes this booklet so attractive. Text, photographs, and illustrations convey the essential aspects of each of the following: oil history, exploration, production, transportation, manufacturing, distribution, marketing, and research. Petroleum products and petrochemicals are also described, as are the environmental implications of oil development and use. A good reference for high school reports and projects. SR

(76) TRANS ALASKA PIPELINE ROUTE. Alyeska Pipeline Service Company, 1835 South Bragaw Street, Anchorage, AK 99512. (double-sided wall chart)

A project that took nine years to design, plan, and construct; involved over 20,000 workers; and cost approximately eight billion

dollars should provoke student interest. This wall chart displays the route of the pipeline, the location and elevation of its pump stations, and describes, on the reverse side, the history of the pipeline, its design, and the operations at the Valdez Terminal. Something for a high school bulletin board. GR

(77) WORK WITH US IN AN OIL COMPANY. Information Systems and Services, Inc., P.O. Box 1231, Milwaukee, WI 53201. (48-page hardcover book: $5.95, softcover edition: $2.95)

ISSI, a not-for-profit corporation, publishes the Work with Us series to increase career awareness among children in grades K-5. This title briefly describes the roles of eighteen occupations related to the discovery, processing, and distribution of oil and its products. Each job introduced includes a full color photograph of youngsters pretending to be at work, a short rhyme conveying the nature of the activity, and a graphic reinforcing the text. Geologist, Oil Transport Manager, Petroleum Engineer, Pipefitter, Chemist, Electrician, Service Station Operator, and Machinist are just some of the vocations discussed. An attempt is made to eliminate sex-related and minority biases and stress that each career is worthwhile and dignified. The degree of discussion this book stimulates will depend upon the grade level of students. These are appropriate books for school or classroom libraries. SR

Natural Gas

(78) EXPERIMENTS: PROPERTIES OF GAS AND HEAT ENERGY. Educational Programs, American Gas Association, 1515 Wilson Boulevard, Arlington, VA 22209. (book of 31 duplicating masters, each an experiment; single copies free, bulk copies $3.50 each)

Appropriate for senior high school students, these experiments might be used in teacher demonstrations, as standard laboratory exercises, or in student project work. Each experiment provides all necessary directions and background information. Illustrations show the required apparatus, which is easily obtained in most science laboratories. Divided into two sections, the manual first offers experiments dealing with the properties and behavior of gases, followed by investigations into the measurement of temperature, heat energy, and thermal characteristics of various substances. An emphasis on developing quantitative skills is evident throughout. GR

(79) THE HISTORY OF NATURAL GAS. Educational Programs, American Gas Association, 1515 Wilson Boulevard, Arlington, VA 22209. (16 page booklet, classroom quantities free)

The history and development of natural gas use is explained in a comic book format. Good introductory material for grades 6-9. SR

(80) HOW YOUR GAS METER WORKS. Educational Programs, American Gas Association, 1515 Wilson Boulevard, Arlington, VA 22209. (chart, two ditto masters, and teacher's guide; single copies free, bulk copies 60¢ each)

A teaching kit for middle school or junior high school general science and social studies classes, explaining the workings of a gas meter. GR

(81) KILOWATTS FROM COWPIES: THE METHANE OPTION. Bullfrog Films, Inc., Oley, PA 19547. (16 mm film, 25 minutes, $45 rental)

Bacterial decay of organic matter in an anaerobic environment will produce methane or biogas. This film documents the way in which several farmers are converting animal wastes into methane for their heating and electrical needs, using the remaining sludge for fertilizer or as a protein supplement. The concepts of recycling and maximum resource use are striking and the applications encouraging. High school students will find this account interesting. SR

(82) NATURAL GAS ENERGY. Educational Programs, American Gas Association, 1515 Wilson Boulevard, Arlington, VA 22209. (28 page booklet; single copies free, bulk copies $1.00 each)

Did you know that if America's natural gas transmission lines were laid end to end, they could reach past the moon? Were you aware that the deepest U.S. natural gas well was drilled over 33,000 feet into the earth? This colorful and well-written booklet provides these facts and many more concerning the formation, exploration, production, transmission, distribution, and storage of natural gas. Considerable attention is also paid to the present commercial, industrial, residential, and electrical uses of the fuel as well as to the new technologies offering greater hope for higher combustion efficiencies and cost-effective extraction from shale, tight sand, coal, and organic materials. A history of the natural gas industry and a perspective on our energy future are included as well. Teachers and high school students should find this piece a good state-of-the-art summary, useful for reports and debates. SR/TR

(83) NATURAL GAS--SCIENCE BEHIND YOUR BURNER. Educational Programs, American Gas Association, 1515 Wilson Boulevard, Arlington, VA 22209. (2 wall charts, filmstrip, 2 duplicating masters, and teacher's guide; single copies free, bulk copies $2.25 each)

General information about the natural gas industry, detailing the flow of gas from the field to home appliances. An exercise in reading the gas meter is also included. Appropriate for middle/junior high school. GR

(84) PIPELINE. Valero Energy Corporation, Community Relations, 530 McCullough, P.O. Box 500, San Antonio, TX 78292. (16 mm film, 19 minutes, free on loan)

Focusing upon the challenges that face a pipeline company charged with transporting natural gas from its producer to its customers, this film describes the many tasks involved in pipeline planning and construction, gas treatment and purification, and system inspection and maintenance. The difficulty in equating gas supply and demand is

stressed, with several techniques to accommodate each explained. Secondary students viewing this film should gain a better sense of the great efforts made to insure a clean, dry supply of methane gas for their use. While the state of Texas is used as an example, the discussion easily transfers to other locales. SR

(85) SCIENCE PRINCIPLES AND GAS APPLIANCES WITH EXPERIMENTS. Educational Programs, American Gas Association, 1515 Wilson Boulevard, Arlington, VA 22209. (33 page manual of experiments with transparencies and ditto master, single copies free, bulk copies $1.60 each)

Five gas appliances are described and their operation is related to several scientific principles. Experiments to illustrate these concepts are outlined and illustrated. This is an excellent resource for secondary school, especially high school physical science classes. The text and organization are exceptional. GR

(86) TOMORROW'S ENERGY. RHR Filmedia, Inc., Suite 1103, 9 East 38th Street, New York, NY 10016. (16 mm film, 20 minutes, free on loan)

Although the viewer might conclude from this film that natural gas or methane supplies are infinite, the discussions pertaining to methane's uses, distribution, and sources are informative. Tight rock formations, geopressure zones in the Gulf of Mexico, garbage, coal, cow manure, water hyacinths, and kelp all will provide natural gas given the appropriate technologies. Have secondary students debate the film's assertions. GR

Coal

(87) THE ABC'S OF COAL LIQUEFACTION. (15 page pamphlet)

WHAT EVERYONE SHOULD KNOW ABOUT COAL GASIFICATION. (15 page pamphlet)

WHAT EVERYONE SHOULD KNOW ABOUT LAND RECLAMATION. (15 page pamphlet)

Education Division, National Coal Association, 1130 Seventeenth Street, N.W., Washington, D.C. 20036.

Middle school students will find these two-color, profusely illustrated introductory pamphlets attractive and readable. The ABC's of Coal Liquefaction describes the process of liquefaction, its historical development, present plans, advantages and challenges, and the future importance of this alternative. What Everyone Should Know About Coal Gasification outlines the technology's importance, present and future status, processing steps, and advantages. What Everyone Should Know About Land Reclamation emphasizes our dependence upon coal and summarizes the steps in analyzing and exploiting the coal reserves, as well as reclaiming the land disturbed through surface mining. Several uses for the reclaimed land are suggested. This piece stresses throughout the maintenance of environmental quality.

These pamphlets provide basically accurate orientations to liquefaction, gasification, and reclamation. However, each publication places the industry in a somewhat more favorable light than experience would warrant. Discussions that analyze the authenticity of the assertions made might well be the best use for these resources. GR

(88) ACID RAIN INFORMATIONAL PACKET. (multi-item packet, $9)

ACID RAIN LIFE SCIENCE PACKET. (activity packet, $9)

ACID RAIN EARTH SCIENCE PACKET. (activity packet, $9)

ACID RAIN BIOLOGY PACKET. (activity packet, $9)

ACID RAIN PHYSICAL SCIENCE PACKET. (activity packet, $9)

ACID RAIN CHEMISTRY PACKET. (activity packet, $9)

ACID RAIN SOCIAL STUDIES PACKET. (draft: free)

The Acid Precipitation Awareness Project, 1037 Bidwell Street, West St. Paul, MN 55118. (teaching packets, $9 each, $50 for all seven if ordered together)

The Acid Precipitation Awareness Project has made an effort to bring together a large amount of material on an important energy-related problem. The result is a heterogeneous but useful collection.

The Informational Packet is a clear bargain, with booklets and brochures from organizations representing the full spectrum of viewpoints. Scholarly and popular journal reprints are included, as well as a "Tentative Outline of Course Content" for a course on acid precipitation awareness.

Each of the various subject packets contains several units, consisting of an activity, lab sheets or worksheets, and a pre- and post-test. Emphasis is on data collection and analysis. There's a good mixture of inquiry and information. The material is not particularly commercial-looking but it's well thought out from an instructional standpoint. Although the activity packets are copyrighted, teachers have permission to duplicate them for their own classroom use. GR

(89) COAL. Reprint from the World Book Encyclopedia. National Coal Association, Coal Building, 1130 Seventeenth Street, N.W., Washington, D.C. 20036. (20 page booklet, single copies free)

This comprehensive nontechnical article was reviewed by the National Coal Association. Profusely illustrated with color photographs and diagrams, the text is highly organized and authoritative in the tradition of its reputable source. A fine resource for junior and senior high school student reports and projects, the reprint also serves well as a student reader. SR

(90) COAL - AN ANSWER TO THE ENERGY CRISIS. New York State Energy Office, Audio-Visual Library, 2 Rockefeller Plaza, Albany, NY 12223. (16 mm film, 13½ minutes, free on loan)

Coal can help America bridge the energy gap until new technologies can be fully developed. This film highlights new methods to extract coal and study the effects of coal mining on the environment. Coal gasification and liquefaction are also explored. Appropriate for middle school. SR

(91) COAL: BRIDGE TO THE FUTURE. Modern Talking Picture Service, Film Scheduling Center, 5000 Park Street North, St. Petersburg, FL 33709. (16 mm film, 28 minutes, free on loan.)

Coal is not the fuel of the future, but it will get us to the future. This is the premise which this film makes and supports with an overview of coal exploration, mining, transport, and consumption in power plants. The efforts directed toward safety and maintaining environmental quality are described. The future promise of coal gasification and liquefaction is also briefly indicated. While the film places continued coal development in a very positive light, secondary students should gain a heightened respect for the significance of the fuel's present role in society. SR

(92) DISCOVERING COAL. Discovering Coal, P.O. Box 14306, Dayton, OH 45414. (instructional kit, $8.95)

This kit includes a filmstrip, cassette tape, ten spirit masters, three wall charts, and a teacher's guide. The guide contains background material keyed to the spirit master activities and some 14 student exercises. These exercises are largely hands-on projects for youngsters. All of the resources are designed to answer the questions that children in grades K-3 would likely have concerning coal: What is it? Where is it found? How is it used? How is it mined? How do miners stay safe? Will coal be in our future? Early elementary teachers should find sufficient material to design their own lessons on coal for their particular classses.

Since the kit was produced by the National Coal Association, absence of information concerning the environmental hazards of coal is not surprising. The teacher may wish to lessen the pro-coal bias of the kit by including such negative impacts. GR

(93) FACTSHEET: NEW FUELS FROM COAL #15. National Science Teachers Association, 1742 Connecticut Avenue, N.W., Washington, D.C. 20009. (4 page booklet, free for stamped self-addressed envelope)

Serious economic and ecological issues will need to be resolved as the United States becomes more dependent upon gaseous, liquid, and solid products from coal. This reference provides technical information regarding conversions, and projects future patterns of use. A worthwhile summary. TR

(94) THE GREAT AMERICAN COAL CHALLENGE. Education Division, National Coal Association, 1130 Seventeenth Street, N.W., Washington, D.C. 20036. (24 page booklet)

Many secondary school students continue to be unaware of the many career opportunities in the energy field. Thus a resource which explains in some detail the challenging roles related to coal mining is most welcome. Beginning with a short introduction to mining methods, the book describes the tasks required in coal exploration, reserve evaluation, mine development, coal production and preparation, maintenance of health and safety, and research. The reader quickly becomes aware of the critical need for geologists, mining engineers, civil engineers, electrical engineers, mechanical and industrial engineers, and chemical engineers within the industry. Opportunities available in government, sales and manufacturing, teaching, and consulting are also described. Colleges offering accredited programs in mining engineering are listed on the back cover of the piece. This glossy, colorfully illustrated pamphlet should appeal to high school students considering a career in geology or engineering. SR

(95) THE MINING OF COAL. Consolidation Coal Company, Film Request, Public Relations Department, Consol Plaza, Pittsburgh, PA 15241. (16 mm film, 17 minutes, free on loan)

Through the use of excellent graphics, animation, and live footage, this film describes coal mining from initial exploration through retrieval, to the use of coal in power plants and industry. The procedures and diverse methods of both underground and surface mining are particularly well discussed. While treatment of acid mine water and reclamation projects are described, the film neglects to address the environmental issues concerning the combustion of coal. However, this remains a fine resource to introduce secondary students to the continuing development of this fossil fuel. SR

(96) THE POWER OF COAL. Education Division, National Coal Association, 1130 Seventeenth Street, N.W., Washington, D.C. 20036. (19 page booklet)

This booklet is a fine introduction for upper elementary and middle school children. Sections are devoted to the formation and types of coal, the history of coal use in America, coal mining, the marketing of the fuel, and present and future applications. The portion pertaining to mining is especially interesting, taking the reader down the shaft, through the main haulageway, to the coal face where several large machines may be at work harvesting the fuel. Both these machines and the equipment carried by each miner are described in some detail. The five quizzes at the end of the booklet help students review their understanding of the text. A teacher's guide provides the answer keys. Despite the fact that the author may be overemphasizing the role that coal will play in the future energy mix, overall this is an attractive learning resource. SR

(97) AN UPDATED PERSPECTIVE ON ACID RAIN. Edison Electric Institute, 1111 19th Street, N.W., Washington, D.C. 20036. (48 page booklet, single copy free)

A clearly stated presentation of the industry perspective on acid deposition, this booklet provides plenty of interesting data. Various sections cover pH values, causes and effects of acidity in precipitation, the Adirondacks as a special concern, corrective strategies, etc. The high reading level and amount of information presented make it most appropriate for grades 11 and 12. TR

Uranium

(98) CNR PUBLICATION LIST. Committee for Nuclear Responsibility, Inc., P.O. Box 11207, San Francisco, CA 94101. (a listing of leaflets, transcripts of presentations, reprints and reports)

Headed by a distinguished Board of Directors, the Committee is devoted to educating the public about the hazards of nuclear power and the advantages of alternate sources. Publications address the "benefit-risk" doctrine and explain public health principles. Teachers should acquaint themselves with the views contained in CNR materials in order to provide a more balanced treatment of the promise of nuclear energy in presentations to students. TR

(99) DANGER: RADIOACTIVE WASTE. New England Coalition on Nuclear Pollution, Inc. Film Rental Library, Box 637, Brattleboro, VT 05301. (16 mm film, 52 minutes, $25 rental)

This N.B.C. documentary investigates the radioactive waste disposal problems resulting from industrial and military development of nuclear power. Leading experts debate the issues and several storage and reprocessing sites are depicted. The experiences in Grand Junction, Colorado and West Valley, New York are described in some detail. New strategies for waste storage in stable geologic formations such as salt mines are also presented.

While this film is somewhat dated (1977) and clearly biased against further nuclear power development, the issues raised are important ones for high school students to consider while studying nuclear energy. With skillful teacher guidance, this resource can be employed to stimulate debate and further research. GR

(100) ELECTRICITY FROM NUCLEAR ENERGY. (26 page booklet)

NUCLEAR ENERGY GLOSSARY. (20 page booklet)

RADIATION. (12 page booklet)

Westinghouse Nuclear Energy Systems, P.O. Box 355, Pittsburgh, PA 15230.

These three booklets provide colorful, informative approaches to better understanding of nuclear power:

Electricity from Nuclear Energy explains through many diagrams and captions the manner in which electricity is produced in nuclear reactors. Well-written and attractive, this piece serves as a fine reader for middle school students. Teachers should plan to discuss its contents in class. GR

Nuclear Energy Glossary defines some 65 commonly used nuclear terms pertaining to electrical generation. The concise definitions should interest youngsters in grades 7-12. SR

Radiation places the medical dangers of normal nuclear power plant operation in perspective, noting that levels of exposure to ionizing radiation from natural background sources are much higher. The government's linear approach to determining radiation limits is discussed and the reader is able to compute his/her own annual radiation dose. While this booklet ignores some wider considerations, such as nuclear waste management, it would be a good reading to analyze in high school classrooms. GR

(101) HOW NUCLEAR PLANTS WORK
MANAGING NUCLEAR WASTE
NUCLEAR REACTOR SAFETY
PLUTONIUM IN PERSPECTIVE
PROTECTING NUCLEAR POWER PLANTS
RADIATION: MEASURE FOR MEASURE
RECYCLING NUCLEAR FUEL
SHIPPING NUCLEAR FUEL
THE SAVINGS WITH NUCLEAR ENERGY
URANIUM: ENERGY FOR THE FUTURE

Atomic Industrial Forum, Inc., Public Affairs and Information Program, 7101 Wisconsin Avenue, Bethesda, MD 20814. (all are 6 page flyers, $.10 each)

These ten brief booklets provide clear, concise discussion of nuclear fuels, reactor operation and safety, the management of wastes, economic benefits, and protection against accidents or sabotage. Constituting fine background reading for teachers and senior high students, their use in preparation for panel discussions and debates is strongly recommended. Instructors should, however, be aware of the pro-nuclear stance of A.I.F. and review materials carefully before prescribing them for pupil use. GR/TR

(102) KNOW NUKES: A NUCLEAR POWER ISSUES CURRICULUM PROJECT. Antioch/New England Graduate School, Roxbury Street, Keene, NH 03431. (45 page booklet of lessons and exercises, $4.00)

This document is a result of the Know Nukes Institute, convened to train teachers to introduce nuclear power issues into their science, social studies, and English classrooms. As a collection of activities, the booklet provides teachers with practical and balanced approaches to examining the nuclear power controversy. Part One focuses upon techniques of persuasion and the nature of bias, propaganda, and ide-

ology. Its lessons help students discriminate between bias and facts, learn the primary persuasive strategies employed in advertising (attention, confidence, desire, and urgency), and analyze general and nuclear-specific advertisements for their design and effectiveness. Actual nuclear power ads and statements are provided along with easy-to-use worksheets. Part Two of the resource emphasizes the value-laden aspects of the controversy. Subsequent to a discussion of values and nuclear power education, four interesting values clarification activities are presented. A final section stresses the moral dilemmas raised in matters of nuclear power development, provides instructional procedures which help youngsters address these dilemmas, and offers two examples for discussion.

Without a doubt, this piece is a superior resource promoting critical thinking and judgment on the part of students. Both sides of the issues are included with no attempts to indoctrinate evident in the materials. Many of the techniques introduced transcend nuclear power and could be employed while approaching other energy-related concerns. Teachers of high school students intending to include this topic within their curricula should consider this resource a "must". GR

(103) NUCLEAR ENERGY - A PERSPECTIVE. Modern Talking Picture Service, Film Scheduling Center, 5000 Park Street North, St. Petersburg, FL 33709. (16 mm film, 27 minutes, free on loan)

While this film fails to provide a comprehensive orientation to nuclear power, its footage pertaining to uranium exploration, mining, enrichment, and processing into fuel assemblies should interest the initiated. Emphasis upon safety measures in light of the Three Mile Island accident is also discussed. Best used in a high school classroom. SR

(104) NUCLEAR EXPERIMENTS YOU CAN DO: FROM EDISON. Charles Edison Fund, 101 South Harrison Street, East Orange, NJ 07018. (32 page booklet of experiments, part of a $1 teaching kit which includes six other titles)

Early secondary science students should enjoy trying the activities suggested herein. Electroscopes and cloud chambers are built from simple materials to show the presence of nuclear radiation. Models of atoms and chain reactions hold interest. Procedures for building a geiger counter are also included. A fine resource. SR

(105) NUCLEAR POWER: ANSWERS TO YOUR QUESTIONS. Edison Electric Institute, 1111 19th Street, N.W., Washington, D.C. 20036. (48 page booklet)

Are nuclear power plants safe? Do Americans support nuclear energy? What are nuclear wastes? These are some of the over forty pertinent questions concerning nuclear energy which are thoroughly addressed in this piece. Though optimistic about future use, the treatment is reasonably balanced, with good insights into the state of the technology. A worthy tool as a high school pupil reader or teacher reference. GR/TR

(106) NUCLEAR POWER FROM FISSION REACTORS: AN INTRODUCTION. U.S. Department of Energy, Technical Information Center, P.O. Box 62, Oak Ridge, TN 37830. (21 page booklet)

Through excellent graphics and accompanying descriptions, this booklet introduces and explains the following topics: main energy sources and uses, alternative sources, fossil fuel plants, nuclear fission, nuclear fuel, nuclear reactor components and reactor types (LWR's, BWR's and PWR's), the LWR fuel cycle, fuel enrichment and reprocessing, the breeding process, breeder reactor design and fuel cycle, and the history of nuclear power in the U.S. and the world. Basic terms pertaining to the fission process, fuel cycle, and nuclear reactors are also defined. This well-written and concise piece is a fine student reader for grade 8 and up. Teachers may well want to duplicate the graphics for use in instruction. If a flaw exists, it is in the lack of attention to reactor safety and proper waste management. SR/TR

(107) A NUCLEAR POWER PRIMER: ISSUES FOR CITIZENS. League of Women Voters Education Fund. Available from the New York State Energy Office, Office of Communications, 2 Rockefeller Plaza, Albany, NY 12223. (80 page booklet)

Inflation, decreasing demand for electricity, international instability, the Three Mile Island accident, and persisting questions of nuclear plant safety and waste management all conspired to suppress further development of nuclear power in the early 1980s. This up-to-date publication attempts to raise the level of sophistication of the ongoing national debate by providing unbiased information in a comprehensible format. The booklet outlines the history of nuclear power development, provides means of measuring and judging risks in using various energy sources, describes nuclear safety and regulatory reform, compares nuclear with fossil-fuel electrical generation, and discusses the issues in nuclear proliferation. A "short course" describing the types and operation of nuclear reactors is also provided, as is an analysis of nuclear fuel cycles.

With its clear, responsible style, this resource merits strong consideration as a teacher reference and high school student text for a unit or course concerning nuclear energy. Its use prior to the employment of biased governmental, industrial, and citizens' action materials will help insure wiser analysis of the latter resources. SR/TR

(108) NUCLEAR POWER QUICK REFERENCE. General Electric, Nuclear Energy Divisions, San Jose, CA. (48 page booklet, up to 49 copies free)

Filled with diverse facts about all phases of the nuclear energy industry, this booklet contains much timely and interesting information. Extensive references are included. TR

(109) A NUCLEAR WASTE PRIMER. League of Women Voters Education Fund. Available from the New York State Energy Office, Office of Communications, 2 Rockefeller Plaza, Albany, NY 12223. (63 page booklet)

The problems of nuclear waste reprocessing, storage, and disposal continue to cast shadows over further development of nuclear power. This brief but balanced introduction to nuclear waste management provides an excellent analysis of the issues so as to encourage responsible citizen action. Sources of waste, radiation hazards, past and present waste management, future disposal alternatives, and the political debate and responses pertaining to the problems are described in an illuminating and concise manner. A list of relevant publications and a listing of organizations with opposing viewpoints are also provided. Since few other resources will be as objective in addressing the topic, this booklet is highly recommended as a teacher reference and high school student reader. SR/TR

(110) POWER IN THE MAKING. (16 page booklet, 1-4 copies $3.50 each, 5-99 copies $3.25 each plus shipping)

WORKING WITH THE ATOM - CAREERS FOR YOU. (41 page booklet, 1-9 copies $1.75 each, 10 or more copies $1.50 each plus shipping)

ELECTRICITY FROM NUCLEAR POWER: A 1982 MAP OF NUCLEAR POWER PLANTS IN THE U.S. (16 page booklet, $1.00)

THE CASE FOR NUCLEAR ENERGY, by Roger Starr. (12 page reprint, $1.00)

HISTORICAL PROFILE OF U.S. NUCLEAR POWER DEVELOPMENT, AIF BACKGROUND INFO. (18 page handout)

NUCLEAR POWER INFORMATION: KEY ISSUES. (9 fact-sheets)

NUCLEAR POWER PLANTS OUTSIDE THE UNITED STATES. (12 page handout)

Atomic Industrial Forum, Inc., Publications Department, 7101 Wisconsin Avenue, Bethesda, MD 20814. (orders must be prepaid)

The Atomic Industrial Forum, Inc. represents over 500 utilities, manufacturers, power plant designers and constructors, uranium mining and milling companies, unions, research laboratories, consulting firms and other organizations committed to the peaceful development of nuclear technology. Given AIF's pro-nuclear position, it will be important for the teacher to bring balance to nuclear topics by contrasting the following resources with counter points of view and documentation.

Power in the Making contains fold-out posters suitable for wall display. Beginning with a discussion of our increasing electrical consumption and the hidden and obvious costs of power plant fuels, each fuel source (oil, gas, solar, coal, and uranium) is assessed for its present and future contributions, advantages, and disadvantages of use. The graphics display each source's system for producing steam so that each boiler can be juxtaposed with the turbine-generator and distribution transformer diagrams common to all. A good piece for the middle school bulletin board. GR

Working with the Atom is an attractive and informative orientation to careers in the nuclear industry. More than two dozen persons with positions in nuclear medicine, health physics, design and construction, generation and operations, mining and milling, and waste management and safety are interviewed, with their own particular backgrounds described. An optimistic nuclear job forecast, listings of schools with nuclear-related programs, and helpful publications and organizations are also included. Senior high students should find this booklet interesting. SR/TR

Electricity from Nuclear Power is a booklet of maps indicating locations of U.S. nuclear reactors in operation, under construction, or on order. Each reactor is listed with its owning/operating utility, net energy capacity, technical type, manufacturer, and date it began commercial operation. Licensing, delay, and cancellation data from 1982 are also provided, along with a 10 year profile of nuclear installed capacity through 1992. A good research tool for senior high students. SR

The Case for Nuclear Energy, by Roger Starr, is a reprint from the New York Times Magazine of November 8, 1981. The author explains why he believes nuclear energy must be further developed in this nation. A good resource to spur debate among high school juniors and seniors. GR

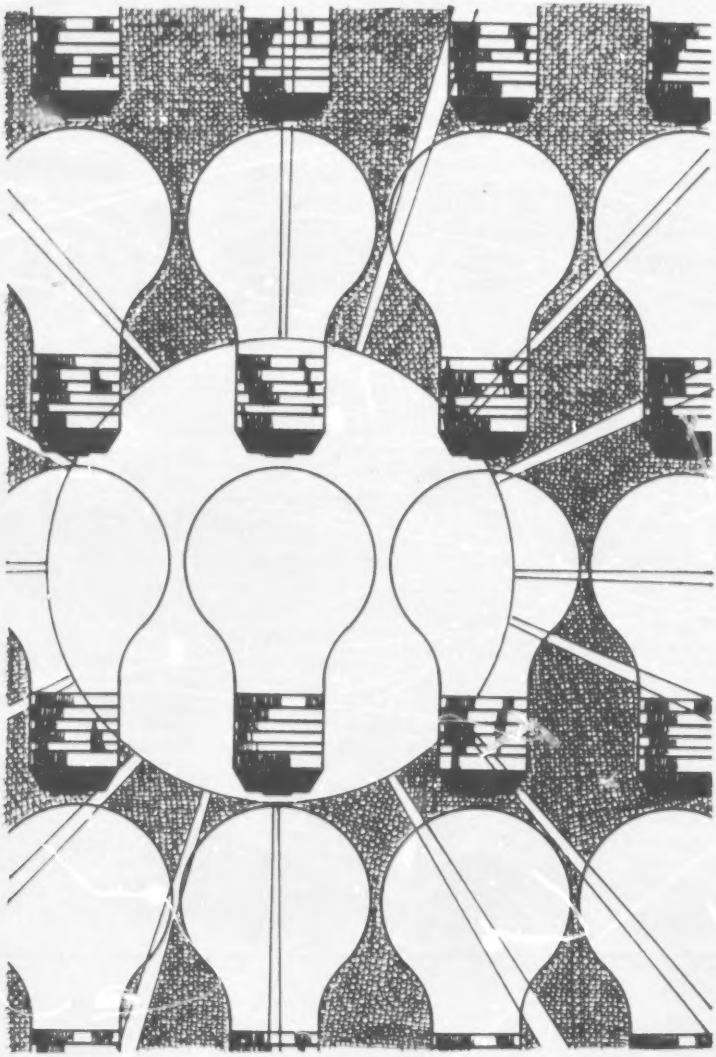
The Historical Profile of U.S. Nuclear Power Development is a history of commercial reactor orders placed, licenses issued, and cancellations and retirements announced from 1953 to the end of 1982. The tables presented are well organized, giving specific information pertaining to each reactor. Collectively, they provide an accurate view of the "feast and famine" within the industry. A good reference for high school debaters and teachers. SR/TR

Nuclear Power Information: Key Issues provides timely and useful information on all facets of nuclear energy, including uranium supplies, fuel recycling, waste management, reactor safety and licensing, low level radiation, international developments, and public acceptance of nuclear power. The sheets are sufficiently objective to merit their use in senior high school discussions and problem analysis. GR/TR

Nuclear Power Plants Outside the United States includes a listing of some 555 commercial generating units found in 40 countries beyond America's borders: those now operating, those under construction or on order, and those at some stage of planning. For each entry, the location, manufacturer, primary utility, reactor type, net capacity, and date of commercial operation are provided. An excellent reference for high school students and teachers. SR/TR

(111) RADIOACTIVE RADIATIONS AND THEIR BIOLOGICAL EFFECTS, by Peter Lindenfeld. American Association of Physics Teachers, Graduate Physics Building, SUNY at Stony Brook, Stony Brook, NY 11794. (58 page issue-oriented module, $2.25 prepaid)

While the theme of this unit is the biological applications and hazards of radioactive materials, considerable information is given concerning radioactive measurement, reactor principles and dilemmas, and the effects of electromagnetic radiation. Work problems and suggestions for experiments are included. Most profitable for individualized study in high school physics. SR



L·I·V·I·N·G B·Y O·U·R W·A·T·T·S

Conservation

With shrinking reserves of fossil fuels and uranium, it would seem natural to hear cries for energy conservation. In fact, conservation of energy is assured by the First Law of Thermodynamics which states that energy cannot be created or destroyed but merely transformed from one form to another. It is then the usefulness of the various forms of energy which makes conservation essential. At present, oil, coal, gas, uranium, moving water, and the electricity they generate are the forms of energy most valued by consumers. Because they are concentrated and convenient, they remain our prime energy sources. Consequently, we must try to conserve them. The materials in this section will provide ideas for conserving these forms of energy at home, in the car, or at work.

(112) BURNING COAL (NRAE-14). Northeast Regional Agricultural Engineering Service, Riley-Robb, Cornell University, Ithaca, NY 14853. Order from Distribution Center, Cornell University, 7 Research Park, Ithaca, NY 14850. (28 page booklet, $1.50)

Following on the heels of its companion volume, Burning Wood, this booklet is a wonderfully comprehensive introduction to the use of coal for home heating. The growing popularity of coal as a fuel source is cited and a chapter is then devoted to the characteristics and forms of coal, and to factors related to its purchase and storage. The main body of the piece pertains to the selection, installation, and maintenance of coal-fired stoves, furnaces, and boilers. Supplemented by excellent drawings, diagrams, and charts, the text is filled with suggestions, cautions, and even some thermodynamic and gas-related principles. The reader will appreciate the painstaking attention to detail and fine organization of this document. The resource should be helpful to high school students preparing individual papers or projects and teachers planning courses in energy conservation. SR/TR

(113) BURNING WOOD. (NE-191). Northeast Regional Agricultural Engineering Service, Riley-Robb, Cornell University, Ithaca, NY 14853. Order from Distribution Center, Cornell University, 7 Research Park, Ithaca, NY 14850. (24 page booklet, $1.50).

In numerous circumstances, wood can provide a worthy supplemental source of energy for heating and cooking. This comprehensive booklet provides a clearly worded introduction into the use of wood as a fuel source, including its measurement, seasoning, storing, and burning. Methods for installing and operating various types of fireplaces, wood stoves, and wood furnaces are also described. Suggestions for cutting firewood with a chainsaw form the appendix. Amply illustrated throughout, this piece provides much practical information to help future home owners rely more upon this renewable energy source. A fine reference for student reports in high school. GR/TR

(114) THE COMPLETE ENERGY SAVING HANDBOOK FOR HOMEOWNERS, by James Morrison. Americans for Energy Independence, 1629 K Street, N.W., Washington, D.C. 20036. (288 page book, $2.50)

The home economics or industrial arts teacher may wish to consider this volume as a high school student text for a unit or elective course on home energy management. Youngsters could perform the home energy audit suggested, completing the weatherization job book included. With parental permission and supervision, students might then choose specific strategies to conserve heat and lower infiltration from the wealth of energy-saving suggestions. Filled with diagrams, charts, and tables, the book provides practical information in a no-nonsense format. GR

(115) CONNECTIONS: A CURRICULUM IN APPROPRIATE TECHNOLOGY FOR FIFTH AND SIXTH GRADES. National Center for Appropriate Technology, Box 3838, Butte, MT 59701. (109 page teacher's guide and classroom poster, $5.00 prepaid)

Appropriate technology implies a local, small-scale approach to a universal problem. It stresses use of human skills and labor, environmental concern, energy conservation, and use of renewable resources. This resource is a fine introduction for students to the concepts, processes, and values of the appropriate technology movement. Ten lessons focus upon the characteristics of appropriate technology, home conservation, transportation, waste management and recycling, renewable resources with an emphasis upon solar energy, and the energetics of food processing and cultivation. Each lesson provides the teacher with objectives, vocabulary, suggested approaches to discussing the concepts, class activities complete with student handout sheets, home activities, and notes on preparing for subsequent lessons. Background readings for the teacher are also included, as are quizzes for all of the lessons. In the main, the materials are interesting and attractive. Given the source, it is not surprising that fossil fuel and nuclear based energy sources are essentially ignored. Still, the goals of this curriculum project are important and the activities should be well received by their intended audience. Worth looking at. GR

(116) ENERGY CONSERVATION. Conservation Consultants, 417 Thorn Street, Sewickley, PA 15143. (information wheel, 75¢)

Turn this wheel and you will discover energy saving measures to take in home heating and cooling, lighting, the kitchen, the bathroom, the yard and garden, the marketplace, using appliances, vacationing, and choosing and using a car. Students from upper elementary grades through high school will enjoy turning this device and learning from it. SR

(117) ENERGY CONSERVATION EDUCATION: AN ACTION APPROACH. New York State Energy Office, Office of Communications, 2 Rockefeller Plaza, Albany, NY 12223. (76 page book of lesson plans)

This curriculum was prepared by the Council on the Environment of New York City for students in grades 4-9. The 17 lessons included follow the classic N.Y.C. format, with sections devoted to each lesson's aim, motivation, materials, development, summary, and homework assignment. Topics stress the conservation of electricity and heat in the school and home and also focus upon alternative energy sources and careers. While many of the lessons are teacher-centered, there are opportunities for student participation. GR

(118) ENERGY CONSERVATION EDUCATION FOR NEW YORK STATE. New York State Energy Office, Office of Communications, 2 Rockefeller Plaza, Albany, NY 12223. (176 page activities book)

This book provides a series of 18 interdisciplinary learning activities for grades 7-12. Meter reading, testing insulation, calculating hot water loss, conserving gasoline, investigating food energy, and comparing fuel sources are just some of the student projects provided. Each activity contains student worksheets and supplementary information for the teacher. The format is the same as the Solar Energy Project activities described later and, as such, is very comprehensive. A matrix indicates the appropriate grade level and subject for each investigation. These hands-on, ready-to-use lessons are very well done and worth getting. SR

(119) ENERGY CONSERVATION: EXPERIMENTS YOU CAN DO. Charles Edison Fund, 101 South Harrison Street, East Orange, NJ 07018. (32 page booklet, part of a $1 teaching kit which includes six other titles)

Cooking a hot dog with the sun, building a draftometer, reading a gas meter, checking clothes dryer efficiency, and many other activities encourage "waste watching" in this booklet. Grades 7 through 9. SR

(120) AN ENERGY CONSERVATION PUPPET SHOW: MORE POWER TO YOU. The Peppermint Playhouse Puppeteers, 620 Red Oak Drive, River Vale, NJ 07675. Telephone: (201) 666-2275. (40 minute performance, charge varies with travel distance)

Uniquely entertaining and educational, this acclaimed show helps the audience become aware of everyone's responsibility to conserve energy resources. Through the antics of puppetry, a lovable cast of characters dramatize energy awareness, power sources, and conservation. Created and performed by two professionally trained women, the show can be seen by large or small groups at school assemblies, PTA functions, classroom activities, fund raising events, and community affairs. The puppeteers bring all their own equipment and supply useful hand-out materials to complement the show. The length of the performance is 40 minutes. Recommended for Grades K-6. An excellent school-wide investment in energy education with special price discounts available. SR

(121) ENERGY MANAGEMENT. Walter J. Klein Company, Ltd., 6301 Carmel Road, Box 220766, Charlotte, NC 28222. (16 mm film, 15 minutes, 24 hour free loan)

Whether in the home, car, or office, there are easy and important techniques and procedures that reduce energy consumption. This well-sequenced film provides almost of suggestions to limit electrical and fossil fuel expenditures, from setting timers on lights and appliances to insulating walls and ceilings. Show this film to middle-schoolers, asking them to list the conservation strategies mentioned. They'll be surprised by how many are provided. SR

(122) ENERGY TIPS. Americans for Energy Independence, 1629 K Street, N.W., Washington, D.C. 20036 (15¢ each)

BEDROOM, BATH AND BEYOND. (7 page flyer)

DRIVING DOWN CAR COSTS. (5 page flyer)

GARDEN, YARD AND WORKSHOP. (3 page flyer)

IN AND AROUND THE KITCHEN. (7 page flyer)

SAVING AT YOUR LEISURE. (3 page flyer)

Altogether, these brochures provide about 140 suggestions for conserving energy in and around the home, while driving, and while pursuing leisure activities. The ideas are feasible and usually easy to implement. Suitable for many projects involving secondary students. SR

(123) GAS MILEAGE GUIDE. Single copies available from new car dealers and from the Technical Information Center, P.O. Box 62, Oak Ridge, TN 37830.

The Guide compares the fuel efficiency of new cars and light-duty trucks approved for sale in the United States. There are two editions--one for 49 States, and a separate edition for vehicles sold in California. An excellent tool for developing student activities. TR

(124) THE HOTTEST SHOW ON EARTH. New York State Energy Office, Audio-Visual Library, 2 Rockefeller Plaza, Albany, NY 12223. (16 mm film, 28 minutes, free on loan)

Produced by the National Film Board of Canada, this is far and away one of the most creative films pertaining to energy ever made. The objective is clear; to provide the viewer with practical techniques to reduce home energy consumption, including installing insulation, weatherstripping, and furnace maintenance. But the approach is so entertaining and humorous that one is hardly aware of being informed at the same time. High school students will ask to see this film again and again. SR

(125) THE HOUSEHOLD ENERGY GAME. University of Wisconsin Sea Grant College Program. Communications Office, 1800 University Avenue, Madison, WI 53705. (20 page booklet, single copies 25¢)

A classic in raising public consciousness, this booklet standardizes energy expenditures into graphic units which can easily be

compared and interpreted. All major home use categories are considered and energy consumption patterns of 1975 are contrasted with those of 1955. Measures for saving energy in each category are listed. The point values applied allow more precision in assessing the relative contributions of different activities and choices. This creative effort will stimulate your own thinking and serve a variety of classroom goals. Can be used flexibly in grades 5 through 12. GR

(126) IT'S OUR CHOICE. Institute of Scrap Iron and Steel, 1627 K Street, N.W., Washington, D.C. 20006. (sound filmstrip, 11 minutes, free on loan)

First sensitizing the viewer to the hazards of polluting our environment, the filmstrip moves on to show how scrap processing promotes conservation and environmental quality. Students are challenged to contribute to the fight against land pollution. The sequencing is logical and interesting. A comprehensive teacher's guide is also included. Appropriate for middle and high school students. SR

(127) MINES ABOVE GROUND - SCRAP: THE SUPERNATURAL RESOURCE. (8 page pamphlet available in classroom quantities)

RECYCLING IRON AND STEEL SCRAP SAVES ENERGY. (16 page booklet, single copies free)

PHOENIX QUARTERLY. (magazine available for free subscription)

The Institute of Scrap Iron and Steel, Inc., 1627 K Street, N.W., Washington, D.C. 20006.

The recycling of scrap iron, steel, and non-ferrous materials holds significant promise both as a conservator of energy and raw materials, and as a source of economic and environmental benefits. The first two pieces listed above describe the impact of scrap processing upon these factors and introduce the reader to the scrap cycle, machinery employed, early processing techniques, and important governmental barriers to future growth of the industry. Phoenix Quarterly is an attractive public interest magazine providing a forum for industry-related events and concerns. These materials collectively serve as excellent teacher references and provide rich data for high school classroom debates and independent research projects. GR/TR

(128) PROJECT RETROTECH: INSTRUCTOR'S KIT FOR HOME WEATHERIZATION COURSE. Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. (Instructor's Guide, $2.25, Stock # 061-000-00153-1; Student Manual, $2.00, Stock # 061-000-00359-2; Charts, $4.50, Stock # 061-000-00156-5; and Job Book, $2.50, Stock # 061-000-00154-9)

This eight hour unit begins with a description of building heat losses, provides methods to compute such losses, and concludes with a four-step analysis of the home weatherization process, including inspection, calculation, evaluation, and installation. Technically oriented, the

materials are relevant and provide many opportunities for algorithmic problem-solving. Partial or complete infusion into a senior high physical science course would make the best use of these well-organized and integrated booklets. GR

(129) PROVIDING FOR ENERGY EFFICIENCY IN HOMES AND SMALL BUILDINGS. PART 1: UNDERSTANDING AND PRACTICING ENERGY CONSERVATION IN BUILDINGS (88 page student text, S/N 061-000-00425-4, $5.00); PART 2: DETERMINING AMOUNT OF ENERGY LOST OR GAINED IN A BUILDING (68 page student text, S/N 061-000-00424-6, $5.00); PART 3: DETERMINING WHICH PRACTICES ARE MOST EFFICIENT AND INSTALLING MATERIALS (114 page student text, S/N 061-000-00421-1, $5.50); STUDENT WORKBOOK (71 pages); TEACHER GUIDE (53 pages). Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

These useful and comprehensive materials were created primarily for vocational education programs in which high school or technical college youth learn of the importance of energy conservation and develop skills in applying energy-saving techniques and strategies to homes and other small buildings. The first volume introduces the student to the concept of energy, its sources and uses, alternate energy prospects, energy use in buildings, the effects of design and construction methods, maintenance of efficient structures, and optimal energy-saving techniques. This book is the least technical of the series and much of it would be appropriate for a middle or high school energy elective. The second volume is the most technical as it devotes most of its attention to the computation of building heat losses and gains, heating loads, cooling loads, and cost benefits of conservation strategies. While the calculations presented and requested are tedious to work through, they are organized in a comprehensible format. Students with a solid mathematical background should have little difficulty. The third volume leads the student to assess which cogeneration practices are efficient and economical, focusing specifically upon building sites and designs, building materials, insulation, vapor barriers, weather stripping, caulking, windows, doors, heating and cooling equipment, ventilation, lighting, water heating, and plumbing. Later sections of this book provide steps to take in installing materials and improving the efficiency of equipment. All three books are well organized with helpful illustrations, charts, and diagrams. The Student Workbook primarily contains tests for each subsection in addition to problems, where appropriate. The Teacher Guide provides the following for each subsection: overview, objectives, tools and materials needed, estimated time, teaching strategies, evaluation, and follow-up and reinforcement. Although this set of resources would be best used as intended, much of the material could be infused into science or energy electives or be of value for student and teacher reference. GR/TR

(130) RUBBISH TO RICHES. Aims Media, Inc., 626 Justin Avenue, Glendale, CA 91201. (16 mm film, 11 minutes, $25 rental)

This film shows how most waste is disposed of in sanitary landfills and describes the possibility of using the gases given off to

produce electricity. It also demonstrates the way in which rubbish may be recycled to produce iron, aluminum and glass, while the light residue is burned to produce power. Pyrolysis is another treatment described. A worthy technology to introduce to middle schoolers. SR

(131) RUNNING ON EMPTY. New York State Energy Office, Audio-Visual Library, 2 Rockefeller Plaza, Albany, NY 12223. (16 mm film, 27 minutes, free on loan)

In the context of a fuel economy road rally, this film quizzes the viewer on the most efficient driving techniques, maintenance procedures, and automotive purchase criteria. Several suggestions are rather surprising. A good film for secondary driver education students. SR

(132) SAVE ENERGY, SAVE DOLLARS (IB-125). New York State Colleges of Human Ecology and Agriculture and Life Sciences, Cornell University, Ithaca, NY 14853. Order from Distribution Center, Cornell University, 7 Research Park, Ithaca, NY 14850. (95 page booklet, single copy $1.50, quantity discounts available)

Although now several years old, this document continues to be an excellent source of hundreds of suggestions for conserving energy at home, at work, and in the car. Home energy management is given the greatest attention. Remedies for cutting heat loss caused by convection and conduction focus upon caulking, weather stripping, storm windows and doors, insulation, humidification, and ventilation. Each remedy is discussed in great detail, with product comparisons, installation instructions, and potential problems provided. Home heating and cooling equipment such as furnaces, stoves and fireplaces, electric heaters, fans and air conditioners are also analyzed for their most efficient and effective use. Hot water use and conservation, efficient use of home appliances, effective lighting, energy-wise furnishings, and strategic landscaping are given considerable attention. Apartment and mobile home dwellers will appreciate the sections devoted to those habitats while house remodelers and buyers are also clued in to important factors to consider. Less extensive sections pertain to automotive efficiency and efficient use of energy for recreation. The last portion of the booklet is written especially for middle and high school youngsters, providing energy-saving tips and activities to stimulate conscious fossil fuel conservation. A summarizing energy management checklist reviews the primary suggestions of the resource.

This booklet is an attractive, well-written guide which middle and high school students should find very helpful in preparing projects and reports or in implementing home energy conservation surveys. Some sound energy principles are interspersed through the text and would reinforce classroom discussion. Teachers should caution students not to undertake procedures suggested unless properly supervised. GR/TR

(133) TECHNOLOGY AND VALUES - THE ENERGY CONNECTION. Film Rental Center, Syracuse University, 1455 East Colvin Street, Syracuse, NY 13210. (16 mm film, 19 minutes, $16 rental)

This animated film traces the development of human civilization, focusing upon the discovery and exploitation of the earth's resources. Energy use has become addictive and a polluted environment and depleted fossil fuel supply give witness to people's self-indulgent habits. The viewer has a choice: to fall victim to the same pressures and desires affecting the film's cartoon characters or support alternative sources and demonstrate a personal energy conservation ethic. While humorous and not always direct, the film succeeds at conveying its message of conservation and responsible use. Secondary students should enjoy debating the points presented. GR

(134) A THOUSAND SUNS. Film Rental Center, Syracuse University, 1455 East Colvin Street, Syracuse, NY 13210. (16 mm film, 9 minutes, $8 rental)

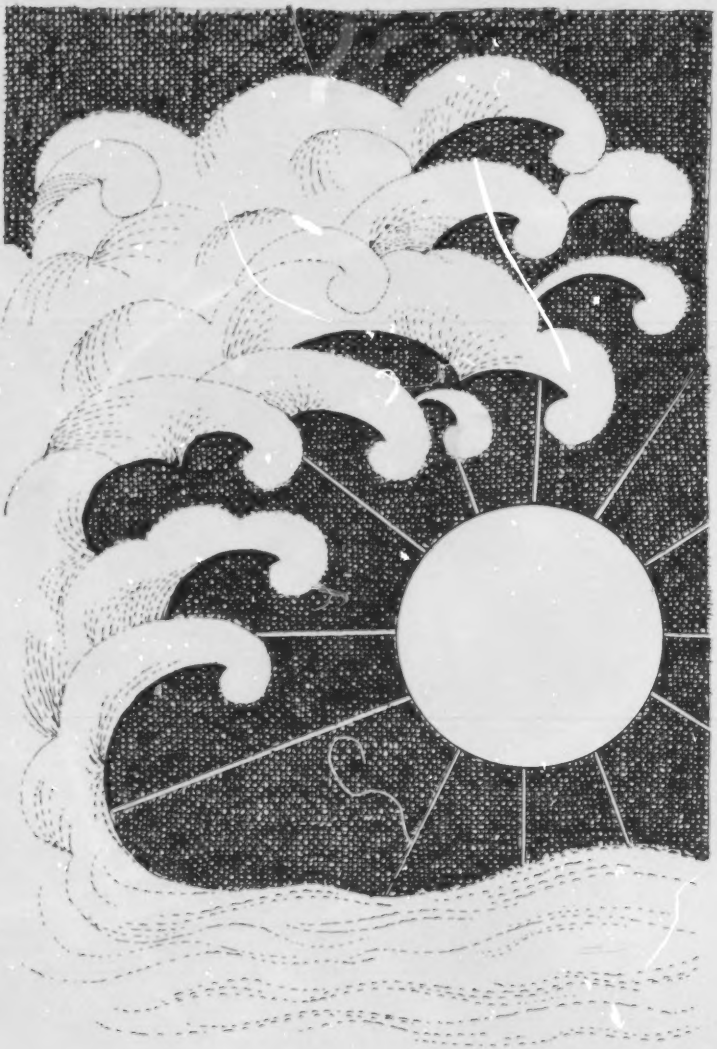
"Energy has made us well-to-do, freed us from drudgery. But can happiness be mass produced? And why is it, the more we buy the lonelier we get? Perhaps we are making things just to be making things." These and other powerful statements and questions fill this award-winning film which examines the ethic of consumption in a throw-away society. The viewer is called upon to consider the worth and permanency of human values such as honesty and respect. How will the present and future generations use the "ultimate energy" that may soon be theirs? High school students will find this film provocative and worthy of discussion. GR

(135) TOAST. New York State Energy Office, Audio-Visual Library, 2 Rockefeller Plaza, Albany, NY 12223. (16 mm film, 12 minutes, free on loan)

Through images set to music, this film depicts the energy-intensive processes needed to prepare a piece of toast. These include oil exploration and processing into fertilizer, wheat cultivation and conversion to flour, and the baking and distribution of bread. The absence of a net energy profit is obvious. Teachers of middle elementary students and up will be able to use this film to stimulate discussion of wasteful fossil fuel applications. GR

(136) WINTER SURVIVAL. New York State Energy Office, Office of Communications, 2 Rockefeller Plaza, Albany, NY 12223. (18 page booklet)

A booklet of tips and reminders on how to save energy while staying warm and healthy during severe winter weather. SR



F·U·T·U·R·E F·U·E·L·S

By the year 2050, our energy resource mix will need to be very different from what it is today. Renewable forms of energy will play much larger roles. Few argue that the technological problems associated with wide scale development of geothermal, wind, and solar resources are beyond eventual solution. In nuclear fusion, we have a potentially infinite source of power as abundant as the oceans' waters. If necessity is truly the mother of invention, we can look forward to many ingenious technical systems that will keep the nation and the world plugged in. The following materials hint at the present triumphs of alternate energy sources and the hopes for our energy future.

Overview

(137) ALTERNATE ENERGY SOURCES. (200 slides, $397.50)

SUN/EARTH: SOLAR ARCHITECTURE. (180 slides, $357.75)

SOLAR HEATING SYSTEMS. (100 slides, $198.75)

SOLAR HOME DESIGNS. (90 slides, $178.88)

WIND ENERGY. (90 slides, $178.88)

EARTH ENERGY ARCHITECTURE. (140 slides, $278.25)

HOLISTIC ENERGY ARCHITECTURE. (130 slides, $258.37)

KaiDib Films International, P.O. Box 261, Glendale, CA 91209.

For teachers who are interested in developing their own energy slide shows for classroom use, KaiDib Films offers a large assortment of slides. All sets may be ordered on 30-day approval, with the option of selecting any individual slides desired and returning the rest. Individual slides are $2.65 each. The slide sets treat their topics comprehensively, and the slides are of excellent quality. TR

(138) THE ALTERNATE ENERGY SUITE. Conservation Consultants, 417 Thorn Street, Sewickley, PA 15143. (tape cassette and supplementary materials, $15 per set)

This is a refreshing and different instructional packet. The "suite" is composed of four songs on the tape cassette: "Make a Trap to Capture the Wind," "Solar Power Rag," "A Mighty River Running Strong," and "Talking Conservation Blues." The melodies are infectious, the lyrics informative. Each song comes with teacher background data and a suggested lesson plan. Pre- and post-tests and song lyric sheets are also provided in ready-to-duplicate form. As students listen or sing along to the songs, they hear phrases which provoke reflection and inquiry later on. Children in grades 3-6 will enjoy this approach. GR

(139) ALTERNATIVE ENERGY SOURCES. Conservation Consultants, 417 Thorn Street, Sewickley, PA 15143. (resource packet, $1.00)

This packet of governmental and commercial booklets reminds one of those mystery stamp packets long advertised. You never are

quite sure of what you'll find but something should strike your fancy. Expect to find items on solar, wind, biomass, geothermal, and fusion technologies. Good hunting! SR/TR

(140) ALTERNATIVE ENERGY SOURCES: EXPERIMENTS YOU CAN DO. Charles Edison Fund, 101 South Harrison Street, East Orange, NJ 07018. (32 page booklet, part of a $1.00 teaching kit which includes six other titles)

Hands-on activities which allow students to explore alternative energy technologies are few and far between. This booklet provides eight such "experiments" pertaining to solar energy, wind power, ocean thermal energy conversion, waste conversion, coal gasification, geothermal energy and fuel cells. Prior to each investigation, the advantages and problems of each alternative source are discussed. Middle school students should then enjoy trying these activities for themselves. The apparatus they construct will enable them to see evidence of the electrical current generated by a photovoltaic cell, wind, and chemical reactions or the heat energy produced by the sun and waste combustion. Worth getting! SR

(141) ALTERNATIVE SOURCES OF ENERGY. Alternative Sources of Energy, Inc., c/o Circulation Department, 107 S. Central Avenue, Milaca, MN 56353. (journal published bimonthly, subscription: $19.50/year)

This journal is a real assist to students and teachers studying renewable, alternative sources of energy. Feature articles in each issue focus upon a single technology, such as photovoltaics, wind power, or passive cooling. The emphasis of the features is on technical information and assessments and practical applications of alternative technologies. An "Energy Focus" section provides informative updates on all aspects of renewable energy, including photovoltaics, wind, solar, conservation, and biomass. Also included are departments containing letters, book reviews, a calendar, and descriptions of equipment promoting energy self-sufficiency. Worth subscribing to if a high school elective course on alternative energy is being offered; otherwise it might be a worthy addition to the school library. SR/TR

(142) ELECTRICITY & ENERGY: TODAY AND TOMORROW. Westinghouse Electric Corporation, Advanced Power Systems Divisions, Box 158, Madison, PA 15663. (29 page booklet)

This booklet provides informative summaries of alternative energy technologies under development, including the nuclear breeder reactor, fusion, synthetic fuels from coal gasification and liquefaction, fuel cells, magnetohydrodynamics, solar heating and electrical generation, wind power, geothermal energy, ocean thermal energy conversion, and biomass. The principles, status, and prospects of each technology are explained with colorful cartoons lightening the conceptual density of the text. As a balanced overview of alternative sources, the booklet stresses multiple use. An appropriate reader for teachers and older high school students. SR/TR

(143) ENERGY: ALTERNATIVES. Public Affairs Office, National Aeronautics and Space Administration, George C. Marshall Space Flight Center, Marshall Space Flight Center, AL 35812. (16 mm film, 14½ minutes, free on loan)

Designed for students in grades seven through nine, this film emphasizes the need to find alternative energy sources to fossil fuels and describes present use of solar, wind, and geothermal resources. Electric cars are also presented as a means to reduce dependence upon oil. Good for introducing a unit on renewable energy. SR

(144) ENERGY: NEW SOURCES. Churchill Films, 662 North Robertson Boulevard, Los Angeles, CA 90069. (16 mm film, 24 minutes, $40 rental)

This film provides brief surveys of new energy sources; including solar heating and electricity, biomass conversion to methane and alcohol, ocean thermal and current electrical generation, wind power, geothermal energy, nuclear fission and fusion, and synfuels production. Advantages and problems related to each source are described and the significant lead time for development is emphasized. Reducing consumption and conservation are recommended. The film can be used as a basic introduction for middle school students. A study guide is included. GR

(145) ENERGY: WHAT ABOUT TOMORROW? Film Rental Center, Syracuse University, 1455 East Colvin Street, Syracuse, NY 13210. (16 mm film, 20½ minutes, $20 rental)

Given diminishing supplies of oil and natural gas, coupled with concerns about further development of nuclear fission power, alternative energy sources must be explored. This film surveys the present and potential contributions of solar, geothermal, and fusion energies. Appropriate applications and problems are also discussed. Best used to introduce alternative energy units to secondary students. SR

(146) FACTSHEETS #1 - #19. National Science Teachers Association, 1742 Connecticut Avenue, N.W., Washington, D.C. 20009. (19 titles, single copies free)

These pamphlets give authoritative and balanced information on such topics as: plant bioconversion; solar, wind, and geothermal energy; breeder and fusion reactors; coal conversions; storage technology. Two fact sheets are devoted to a glossary of terms and an extensive bibliography. The reference value of such summaries for projects and discussions in senior high is inestimable. NSTA plans to publish new Factsheets in book form in the near future. GR

(147) THE RENEWABLE ENERGY PRIMER. Solar Energy Project, SUNY at Albany, 1400 Washington Avenue, P.O. Box 22425, Albany, NY 12222. (179 page text, $15, plus $1.50 for postage and handling; make check payable to The Research Foundation of SUNY)

This is one of the finest introductions to renewable energy sources available to high school students. Emphasizing the energy from the sun, chapters acquaint the reader with the physical and mathematical concepts needed to truly appreciate solar potential and technological applications. Besides including such topics as solar radiation, passive and active designs, and photovoltaics; the book treats the earth as a giant solar energy collector and also explores other renewable sources such as the wind, water, tides, geothermal energy, and biomass conversions. Attractively illustrated and organized, this well-written volume would serve as an excellent text for semester courses in alternative energy technologies. SR

(148) SUPPLEMENTARY ENERGY SOURCES. American Petroleum Institute, Publications and Distribution Section, 2101 L Street, N.W., Washington, D.C. 20037. (32 page booklet)

Written in a nontechnical style, this booklet gives brief accounts that sensitize one to the potential and problems of each alternate energy source, including coal-derived gas and fuel, oil shale, tar sands, geothermal, nuclear, solar, biomass, and wind. Current research and development is indicated. Can be used to initiate deeper group study in high school. A one-page lesson plan is also included. GR

Breeder Reactors/Fusion Reactors

(149) FACTS. (8 page flyer)

BREEDER BASICS. (36 page primer)

CLINCH RIVER BREEDER REACTOR PLANT PROJECT DESIGN DESCRIPTION. (26 page booklet)

HOW MUCH RADIATION WILL THE PUBLIC RECEIVE FROM THE CLINCH RIVER BREEDER REACTOR PLANT? (3 page flyer)

LET'S TALK ABOUT ENERGY AND THE ATOM. (9 page flyer)

PROGRESS REPORT - CLINCH RIVER BREEDER REACTOR PLANT PROJECT. (current and prior years available)

PROJECT MANAGEMENT CORPORATION ANNUAL REPORT. (current and prior years available)

SIMULATED FAST BREEDER FUEL PELLET CARD.

HOW TO HANDLE NUCLEAR WASTE CARD.

BREEDER BRIEFS. (monthly update available on request)

Breeder Reactor Corporation, Information Division, P.O. Box U, Oak Ridge, TN 37830. All materials are available in bulk or single copies at no charge.

These publications serve to acquaint both teachers and their students with current developments occurring in the construction of the first U.S. Liquid Metal Fast Breeder Reactor, slated for completion in 1989. Facts provides a brief yet concise overview of the project; Breeder Basics explains how a breeder creates more fuel than it uses,

traces the steps in breeder development, and reports on breeder progress here and abroad; and CRBRP Design Description describes and illustrates the major plant systems and components with the technical detail appropriate for teacher and advanced student reference. How Much Radiation compares the radiation dose from living near the reactor with other sources of radiation inherent in one's lifestyle. Let's Talk About Energy and the Atom discusses the potential energy contribution of the breeder in the context of fossil fuel and alternative sources, also addressing the issues of safety, waste treatment and isolation, and nuclear weapons proliferation. While both the progress and annual reports are glossy public relations documents; their charts, tables, and photos are informative and the descriptions provide a sense of the magnitude of the project. The Breeder Fuel Pellet and How to Handle Nuclear Waste cards offer students a hands-on look at simulated breeder fuel and a method of high-level radioactive waste disposal. Breeder Briefs provides continual updates on plant site preparation, component procurements, and government/utility support.

The development of the breeder reactor has met with considerable resistance within the past several years. While these materials are obviously biased in favor of the project, the resources are attractive and educational. The sophistication of the technology and this literature restricts the latter's use to high school upperclassmen. With this caution, these pieces would be helpful to students as they prepare reports, debates, and public policy simulations. Teachers should certainly encourage youngsters to examine the materials with a critical eye to accuracy, balance, and consistency. GR/TR

(150) FUSION: THE ULTIMATE FIRE. Film Rental Center, Syracuse University, 1455 East Colvin Street, Syracuse, NY 13210. (16 mm film, 14 minutes, $12 rental)

This nontechnical film reviews the limitations of fossil fuel and nuclear fission derived energy, offering the hope of nuclear fusion to meet our future needs. Animated sequences help to explain the fusion process and scientists at Los Alamos and Livermore laboratories are shown using magnetic fields and laser technology to create controlled fusion reactions employing the hydrogen from water. A good introductory film for secondary students. SR

(151) INTRODUCTION TO NUCLEAR FUSION POWER AND THE DESIGN OF FUSION REACTORS, by J.A. Fillo. American Association of Physics Teachers, Graduate Physics Building, S.U.N.Y. at Stony Brook, Stony Brook, NY 11794. (54 page issue-oriented module, $2.25 postpaid)

This booklet divides its text and problems into three segments. Segment one explains the fundamental principles of fusion power; including fusion reactions, the obstacle of charged-particle repulsion, necessary physical conditions for the fusion process, minimum ignition temperature, and the nature of the Lawson criterion. Segment two addresses the fundamentals of confinement; contrasting magnetic confinement with inertial confinement, describing the motion of charged particles in a magnetic field, and discussing the Tokamak and other

fusion reactor designs. Segment three concerns itself with the safety and pollution aspects of fusion reactors, comparing their potential hazards with those associated with fission reactors and describing problems of scale and cost. Suggestions for projects, reading, and research along with illustrative tables and figures complete the document. The prerequisite topics listed for this module, coupled with the mathematics employed in the text, restrict the booklet's use to advanced physics students and teacher reference. Given this limitation, the module is well done. SR/TR

(152) TO BOTTLE THE SUN. Film Rental Center, Syracuse University, 1455 East Colvin Street, Syracuse, NY 13210. (16 mm film, 5 minutes, $7.50 rental)

This is a short but excellent introduction to fusion nuclear reactors, specifying the progress thus far and the difficulties yet to be overcome. Most suitable for students in grades 11 and 12. SR

Geothermal

(153) GEOTHERMAL ENERGY. Energy, P.O. Box 62, Oak Ridge, TN 37830. (15 page booklet)

This pamphlet is a handy introduction to the origin, discovery, location, and use of geothermal energy. The contribution of geothermal energy to electrical generation is contrasted with "direct use" applications, such as space heating, food processing, and crop drying. Recent research in tapping hot dry rock and geopressured reservoirs is briefly explained. A consideration of environmental effects, legal and economic problems, and future prospects concludes the report. A good secondary student reader. SR

(154) GEOTHERMAL ENERGY. Union Oil Company of California, Corporate Communications Department, P.O. Box 7600, Los Angeles, CA 90051. (12 page booklet)

Initially describing what geothermal energy is, how it is produced, and what forms it may take; this booklet moves on to explain various methods of discovery, production, and use in electrical generation. The developmental potential of geothermal is assessed and Union Oil's involvement in domestic and foreign geothermal field exploitation is discussed. The recent progress in the Philippines is particularly interesting and important. Colorful photos and diagrams and an optimistic prognosis make this an attractive geothermal reference for teachers and high school students. GR/TR

(155) GEOTHERMAL ENERGY FROM HOT DRY ROCK. Los Alamos Scientific Laboratory of the University of California, P.O. Box 1663, Los Alamos, NM 87545. (16 mm film, 15 minutes, free on loan)

The heat energy trapped in crustal dry rock is a universally available energy source. Yet finding ways to extract this heat for electrical generation and space heating has challenged scientists and

engineers. This film, through animated and live sequences, describes the nature of this energy resource and focuses in on a pilot project designed to "capture" its heat by rock fracturing and water circulation. Well done and useful for secondary students. SR

(156) GEOTHERMAL ENERGY: TEACHER'S GUIDE, STUDENT WORKSHEETS. U.S. Department of Energy, Technical Information Center, P.O. Box 62, Oak Ridge, TN 37830. (instructional packet)

Intended for use in grades 7-9, this packet contains sufficient material for two 45-minute classes on geothermal energy. On the first day, students conduct an investigation which measures the temperature gradient in a can of sand exposed to radiant heat, with some teacher-contrived and unpredictable results. This activity generates a discussion of the earth's geothermal gradient and the way in which it might be affected by the inner core, liquid core, and mantle beneath the crust. On the second day, diagrams of crustal plate interactions and a thermal field encourage students to hypothesize about the principles of geothermal heat formation and extraction. Students are asked to plot temperature versus depth in a geothermal field and compare the resulting graph with a similar plot of a non-geothermal area. Finally, it is suggested that the film "Geothermal Energy, Nature's Boiler" be shown and several follow-up questions are provided to focus student attention upon the present and potential applications of geothermal energy. A drawing to be completed by youngsters serves to integrate their understanding of the appropriate use of steam and hot water for electrical generation, horticulture, and space heating. Teachers will find the guide informative and supportive of the five student activities. The unit can be implemented with a minimum of prior effort and materials. The film, however, can no longer be otained directly from the Department of Energy. Rather, it can be rented for $25 from the National Audiovisual Center, National Archives and Records Service, General Services Administration, Order Section/RE, Washington, D.C. 20409. This fairly well done packet becomes even more invaluable when one realizes just how few activities pertaining to this alternative source exist for the classroom. GR

(157) GEOTHERMAL - NATURE'S BOILER. National Audiovisual Center, National Archives and Records Service, General Services Administration, Order Section/RE, Washington, D.C. 20409. (16 mm film, 7 minutes, $25 rental)

A timely presentation on the contemporary use potential of geothermal heat energy for electrical generation and space and water heating. The large field in northern California is emphasized. Most appropriate for senior high school. SR

(158) GEOTHERMAL: THE HOT ONE. EG & G Idaho, Inc., P.O. Box 1625, Idaho Falls, ID 83415. (16 mm film, 15 minutes, free on loan)

This film, through animation and live sequences, explains how geothermal reservoirs are formed and describes the present and potential applications of this energy resource. Beyond generating electrical power, geothermal energy is shown to have many other uses, including space heating, irrigation, and aquaculture. Middle and early high school youngsters should find this film interesting. GR

(159) GEOTHERMAL - THE ROARING RESOURCE. California Department of Water Resources, P.O. Box 388, Sacramento, CA 95802. (16 mm film, 22 minutes, free on loan)

In the United States, the major geothermal power plants are located at a steam field in northern California known as the Geysers. While focused largely upon this facility, this film is probably the best presently available on the subject. Excellent instructional design. SR

(160) THE STORY OF GEOTHERMAL ENERGY. Union Oil Company of California, Corporate Communications Department, P.O. Box 7600, Los Angeles, CA 90051. (wall chart)

This colorful chart is primarily a diagram displaying the step by step process by which geothermal energy is extracted from the earth and used to create electricity. Accompanying text, photos of geothermal wells, and a map showing areas of geothermal potential and development are included. Although Union Oil's activities are noted in rather glowing terms, the value of further development of this energy resource should justify the chart's use in upper elementary and middle school classrooms. GR

Wind

(161) CATCH THE WIND: A BOOK OF WINDMILLS AND WINDPOWER, by Landt Dennis. Four Winds Press, 50 West 44th Street, New York, NY 10036. (114 page book, $8.95)

This is one of the most popular trade books recently written on the subject. The volume begins with a discussion of the causes and nature of winds, followed by historical accounts of windmill development and use in Holland, the United States, and the rest of the world. Filled with fascinating anecdotes and supported by fine photographs and illustrations, these well-written chapters also provide contemporary summaries of present applications and research plans. Clearly the strength of this book lies in its setting wind machines within a cultural context. Few would fail to be intrigued by the use of windmills as signals during war or as vacation homes for the affluent. Students in eighth grade and up will enjoy this book; it certainly should be in every school library. SR

(162) THE ENERGY ADVENTURES OF ERNIE AN' BUD. Environmental Action Resource Service, Box 8, Farisita, CO 81037. (8 page color-and-cut comic book; 1-9 copies 60¢ each, 10 or more copies 40¢ each)

This interesting little booklet has Ernie the eagle and Bud the earthworm build and erect a wind generator. The story frames can all be colored and cut-outs are provided so children can recreate the tale themselves. Third and fourth grade students should benefit the most from this resource. GR

(163) HARNESS THE WIND. New York State Energy Office, Audio-Visual Library, 2 Rockefeller Plaza, Albany, NY 12223. (16 mm film, 12 minutes, free on loan)

Produced by the National Film Board of Canada, this film uses spectacular animation to trace the history of wind power utilization. Sequences demonstrate how the early windmill was progressively refined and highlight present and potential applications of wind electrical generators. Important technical concepts are injected where appropriate. Secondary students will be "glued to the screen" for this film. Highly recommended. SR

(164) NEW YORK STATE WIND ENERGY HANDBOOK. New York State Energy Office, Two Rockefeller Plaza, Albany, NY 12223. (51 page booklet)

Published as a guide for the New York farmer, resident, or business-person considering the use of wind energy, this well-written and attractive booklet would serve as a fine resource for high school students preparing a wind energy project or report. Following a brief introduction into the history of windmills and wind terminology; the design, operating characteristics, components, installation, and maintenance of wind energy systems are described in detailed, yet non-technical language. Sizing and energy storage and back-up concerns are also addressed. A third chapter is devoted to the principles of wind power and to the effects of geographical and topographical features upon wind velocity. The nature of New York winds is discussed and suggestions for taking wind measurements provided. Subsequent chapters deal with the legal, social, and environmental issues affecting the installation of a wind energy system, the economics of choosing such a system (pay-back period, costs, and savings), and the primary steps in making a decision to install. A helpful bibliography is included, as are appendices giving unit conversion tables and specific monthly and annual wind speeds for selected N.Y.S. stations. Well illustrated throughout, teachers and students should find this a welcome reference. SR/TR

(165) WIND. Film Rental Center, Syracuse University, 1455 East Colvin Street, Syracuse, NY 13210. (16 mm film, 10 minutes, $8 rental)

A kaleidoscope of color, images, and movement portray the functions of the wind in a small boy's imagination. Only his laughter and the varying sounds of the wind can be heard. Produced by the National Film Board of Canada, this film provides a delightful introduction to the wind's energy for children in grades K-3. They will be drawn to the fantasy and have their own senses awakened. A study guide is included. SR

(166) WIND MACHINES: REPORT PREPARED FOR NATIONAL SCIENCE FOUNDATION, by Frank R. Eldridge. Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. (78 page book, $5.50)

For the more serious student of wind-powered machinery, this document provides authoritative system performance and design data in an attractive format. Much nontechnical information on the history of wind generators and their potential applications is also included. A glossary, list of equipment suppliers, and a selected bibliography add to the merit of this very fine resource for class projects or curriculum development. GR/TR

(167) WINDPOWER, by Harry Davitian. American Association of Physics Teachers, Graduate Physics Building, S.U.N.Y. at Stony Brook, Stony Brook, NY 11794. (61 page issue-oriented module, $2.25 postpaid)

For the scientifically adept advanced physics student, this module will provide challenge and interest. Since the most likely potential market for wind machines is in electrical generation, this booklet restricts its discussion to the contribution that wind power might make to electric utilities. Segment one analyzes the theoretical and practical power of the wind with some mathematical sophistication, also addressing wind machine design characteristics. Segment two evaluates the energy available from wind in the U.S., discussing the cyclical aspects of wind power and the dynamic characteristics of electric utilities. The concept of "load" is described in some detail. Finally, segment three investigates the operating costs for utilities using several different energy sources and considers the economics of supplementing plant capacity with wind power. Each segment contains several problems which help place the reader in a more active role. It must be stressed that the sophistication of this module restricts its use to those few exceptional secondary students possessing a background in physics and calculus. Physics and economics instructors may also find the resource a valuable reference. SR/TR

(168) WIND POWER: A TURNING POINT. Christopher Flavin, Worldwatch Paper 45, July 1981. Worldwatch Institute, 1776 Massachusetts Avenue, N.W., Washington, D.C. 20036. (56 page booklet, $2.00)

As one of the well-respected Worldwatch Paper Series, this booklet provides an excellent nontechnical introduction into the past, present, and potential applications of wind power. The promise of wind pumps and wind generators for residential electricity and utilities is described in detail, citing the technological, economic, and political advantages and constraints. While the scenario depicted is a hopeful one, the assessments are credible and quite realistic. The international perspectives given make the work even more appealing. Teachers and advanced secondary students should find this an attractive reference. SR/TR

(169) WIND POWER DIGEST. Published quarterly by Solar Usage Now, Inc., Box 306 - 420 East Tiffin Street, Bascom, OH 44809. (4 issues/year, $12)

Timely information on wind energy applications is provided by this periodical. Departments pertaining to international and national events and projects, new publications, a calendar of meetings, and classified ads keep the reader updated in the field. The magazine also contains good anecdotal material. TR

Solar

(170) THE ATTACHED SOLAR GREENHOUSE. New York State Energy Office, Audio-Visual Library, 2 Rockefeller Plaza, Albany, NY 12223. (16 mm film, 28 minutes, free on loan)

Solar greenhouses have become a very popular application of passive techniques. This absorbing film reviews the fundamentals of greenhouse design and surveys a great range of structures built to produce heat, provide food, and/or offer interesting living space. From owner-constructed to commercially designed sunspaces, each greenhouse is shown to serve the particular needs of its inhabitants. Secondary students should enjoy this overview of a very practical solar concept. SR

(171) LIGHT IDEAS. Arizona Solar Energy Commission, 1700 West Washington, Room 502, Phoenix, AZ 85007. (4 page newsletter)

Published six times a year, this free newsletter is filled with articles, activities, and sources pertaining to some aspect of solar energy. Recent issues have emphasized solar history, passive design, water heating, photovoltaics, cooking, and economics. A section that reviews books and teaching materials is included. Profusely illustrated, students of upper elementary age and above will find this an attractive and useful resource. SR

(172) CONSERVATION AND RENEWABLE ENERGY INQUIRY AND REFERRAL SERVICE, P.O. Box 8900, Silver Springs, MD 20907. Toll-free hotline: (800) 523-2929.

In May, 1981, the National Solar Heating and Cooling Information Center (NSHCIC) became the Conservation and Renewable Energy Inquiry and Referral Service (CAREIRS). CAREIRS provides information on all the primary renewable energy technologies and on energy conservation. The service can also refer inquiries to a nationwide network of public and private agencies, associations, and businesses which provide more technical or regionally-specific data. CAREIRS makes available to the public the following information leaflets pertaining to solar energy:

SOLAR ENERGY SYSTEMS CONSUMER TIPS (4 pages) provides basic guidelines for consumers contemplating the purchase and installation of a solar heating system. A list of possible problems related to purchase, maintenance, installation, and

operation is given and a checklist for comparing solar contractors is also included.

SOLAR ENERGY AND YOUR HOME: QUESTIONS & ANSWERS (4 pages) uses a question-answer format to discuss basic principles of active and passive systems, investment decisions, tax advantages, and sources of information and equipment. A helpful list of nontechnical books and periodicals is also provided. Very well done.

CONVERTING A HOME TO SOLAR HEAT (4 pages) offers tips to consider when assessing the feasibility of an active or passive solar heating retrofit. Climate, siting, and conservation factors are discussed, as are the appropriate techniques and designs for active and passive systems. A table showing which active components are compatible with common heat distribution systems is a worthy inclusion.

SPACE HEATING WITH ACTIVE SOLAR ENERGY SYSTEMS (4 pages) is a more detailed account of the construction and function of active solar system components. The differences between and relative advantages and disadvantages of air and liquid systems are given considerable attention. Controls, maintenance, backup heating, and economics are also mentioned. A bibliography concludes the leaflet.

SOLAR WATER HEATING BIBLIOGRAPHY (2 pages) lists about thirty books, reports, pamphlets, plans, and articles on the subject.

LOW-COST PASSIVE SOLAR RETROFITS (6 pages) provides somewhat detailed descriptions of six passive retrofit systems, focusing upon their design, mode of operation, limitations, and cost. Thermosiphoning air panels, window box collectors, trombe walls, and solar greenhouses are discussed as appropriate for space heating; breadbox and thermosiphoning water heaters are also included. A bibliography and list of resources for do-it-yourselfers make this a very informative and valuable leaflet.

THE SOLAR GREENHOUSE (4 pages) emphasizes the use of the greenhouse as a home heating system. Its functioning components, optional designs, and prime advantages are clearly presented. As with the rest of these leaflets, fine illustrations are included with the text.

SOLAR GREENHOUSE BIBLIOGRAPHY AND LIST OF PLANS (2 pages) provides a list of about thirty books, pamphlets, proceedings, reports, papers, and plans concerning the subject.

PASSIVE SOLAR COOLING (3 pages) discusses several nonmechanical means to cool a home; including conservation, reducing internal heat sources, shading, ventilation, using vegetation, earth-sheltering, desiccant cooling, and use of roof ponds.

Collectively, these nine resources provide the reader with a fundamental orientation to the concepts of active and passive solar heating. The nontechnical language should make them comprehensible to youngsters of middle school age and older. Good references for use in preparing reports and projects or to provide background reading. GR/TR

(173) ENERGY AND SOLAR HEATING, by Frank C. Bason. American Association of Physics Teachers, Graduate Physics Building, S.U.N.Y. at Stony Brook, Stony Brook, NY 11794. (58 page issue-oriented module, $2.25 prepaid)

This is an excellent independent study resource for students adept in physics. The concepts of energy, work, heat, and power are developed mechanistically and applied to solar radiation. A lab exercise concerned with measuring the intensity of sunlight through use of a solar calorimeter is described. The final series of lecture notes deals with solar heating systems. Exercises and problems are distributed throughout the booklet. The sophisticated nature of the material restricts its use to advanced secondary course work. SR

(174) ENERGY FROM THE DAY STAR. Modern Talking Picture Service, Film Scheduling Center, 5000 Park Street North, St. Petersburg, FL 33709. (16 mm film, 27 minutes, free on loan)

This film surveys active and passive solar energy installations in new and existing homes throughout America While a nontechnical approach is taken, secondary students should enjoy seeing the diverse applications produced. An accompanying discussion guide provides a film synopsis, background information, and pre-viewing and post-viewing instructions in an attractive format. Together, the film and guide give an optimistic picture of solar development and potential. GR

(175) IF YOU CAN SEE A SHADOW. Bullfrog Films, Inc., Oley, PA 19547. (16 mm film, 28 minutes, $45 rental)

This is a clear introduction to passive solar heating. The host explains its basic principles; contrasts direct, indirect, and isolated heat gain; and provides many examples of passive construction to reinforce the ideas. Trombe walls, attached greenhouses, passive solar hot water, mass storage techniques, and underground homes are just some of the applications discussed. The value of living in greater harmony with nature and decentralizing one's energy source is emphasized. Although the rental rate may be prohibitive for some, this film is a fine resource for secondary students. SR

(176) RAYS OF HOPE: THE TRANSITION TO A POST-PETROLEUM WORLD, by Denis Hayes. W.W. Norton & Company, 500 Fifth Avenue, New York, NY 10110. (240 page book, $4.95)

This is a classic in solar advocacy. The global transition to a post-petroleum world is examined as fossil fuels become more economically and environmentally distasteful, not to mention in shorter supply.

This thoughtful analysis of solar energy and other renewable sources is a good introduction for students in grades 11-12. Due to its 1977 publication date, teachers should be alert to the reversals in some trends described. SR

(177) SOLAR AGE. P.O. Box 985, Farmingdale, NY 11737. (published monthly by SolarVision, Inc., $24 per year)

As the official magazine of the American Section of the International Solar Energy Society, this journal provides feature articles on all facets of solar design and technology. A multitude of departments abound, among them: letters, questions and answers, solar clips noting current events, a review of solar business, product updates, and classified ads. A handy reference for the high school library. SR/TR

(178) SOLAR CONCEPTS: A BACKGROUND TEXT. (129 page student reader)

SOLAR CONCEPTS: TEACHER NOTES. (135 page teacher's guide)

Maine Audubon Society, 118 Old Route One, Falmouth, ME 04105. ($9.00 per set)

These two books provide a basic curriculum in solar energy for eleventh and twelfth grade students. The student reader devotes chapters to energy terminology, renewable energy sources, solar energy history, solar radiation, heat transfer principles, and passive and active solar applications. The teacher's guide provides a set of teaching approaches to complement each chapter of the student reader, including learning objectives for each chapter, quizzes and a final exam, and details for constructing several student projects such as an altimeter, parabolic concentrator, window collector, and thermal shutters. While requirements specific to Maine are emphasized, most of the material is of general value. Vocational and technical programs might benefit most from this resource, although portions could be adapted for use in physical science classes. GR

(179) SOLAR DWELLING DESIGN CONCEPTS. U.S. Department of Housing and Urban Development. Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. (146 page book, $6.50)

This profusely illustrated book is well worth the expense. In addition to providing details on solar components and systems, this volume goes further in describing the environmental and architectural conditions that influence the design of solar dwellings. Planning of the site is analyzed and solar applications to traditional and advanced housing designs are given to exemplify the principles discussed. A very intriguing reference book. TR

(180) SOLAR ENERGY EDUCATION BIBLIOGRAPHY: BOOKS, FILMS, AND SLIDES. Center for Renewable Resources, 1001 Connecticut Avenue, N.W., Suite 510, Washington, D.C. 20036. (75 page booklet, single copy $3.95, add 15% for postage and handling)

This publication is worth its weight in platinum. Hundreds of publications, audiovisuals, and periodicals pertaining to most forms of renewable energy (solar, wind, falling water, and biomass) are annotated with a keen eye to what would be useful in the classroom or workshop. The publications are divided up among those appropriate to elementary, secondary, and college levels of instruction. In the audiovisuals section, films, videocassettes, slides, and filmstrips are presented alphabetically by title with the target audiences noted. Newsletters, journals, and magazines constitute the periodicals described. In nearly every case, the source, date of publication, and price are provided for each resource reviewed.

Teachers and high school students will find this an excellent point of departure from which to launch investigations into the topics considered. In addition to governmental entries, many of the more expensive commercially produced materials are also annotated, serving the interests of those with a wide range of funding opportunities. This document is worth every penny!! SR/TR

(181) SOLAR ENERGY EDUCATION: STUDENT ACTIVITIES. Solar Energy Project, SUNY at Albany, 1400 Washington Ave., P.O. Box 22425, Albany, NY 12222. (book of 25 activities, $5.50; reproducible and multiple copies of individual activities may also be ordered, send for order blank. Make checks payable to The Research Foundation at SUNY)

This book of field-tested and revised activities is one of the finest resources available in solar energy education. Each reproducible student activity contains an introduction, objectives, prerequisite skills and knowledge, materials and equipment needed, procedures, questions, a summary, and suggestions for further investigation. Student worksheets, data tables, and helpful illustrations are also included. For each activity, a teacher information section provides the following: suggested grade level and skill area, skill objectives and major understandings, background reading, advance planning notes, suggested time allotment, suggested approach, precautions, points for discussion, typical results, modes of evaluation, possible modifications, and useful references. The home economics activities probe appliance use, alternative energy lifestyles, window treatments, and energy conservation and renewable sources. The industrial arts activities have students construct a thermosiphoning solar collector, compare several passive solar gain models subsequent to construction, and make a photovoltaic demonstrator. Sending for energy information, administering a solar survey, analyzing energy cartoons, and solving a sun rights dilemma characterize the social studies activities. The remaining activities will appeal most to science teachers. The model solar hot air and water collectors which can be constructed and tested are classics in the field. Students in junior high or middle school also may construct a solar desalinizer, study absorption, build passive home models, and evaluate the feasibility of installing wind generators near their actual residences. High school youngsters will enjoy investigating the greenhouse effect, monitoring home energy use, considering the leaf as a solar collector, researching wood heat, examining heat storage capacities of salts and paraffin, comparing absorber plate coatings, and building a renewable energy file of references.

Teachers of students from grades six through twelve will find many infusion opportunities which reinforce common subject area goals while capitalizing on youngsters' interest in energy sources, uses, and issues. Don't let these marvelous lessons escape your attention! GR

Also available from the above address are activity packets specific to science (add 10% for postage and handling):

RENEWABLE ENERGY ACTIVITIES FOR JUNIOR HIGH/ MIDDLE SCHOOL SCIENCE. ($4.25)

RENEWABLE ENERGY ACTIVITIES FOR GENERAL SCIENCE. ($3.50)

RENEWABLE ENERGY ACTIVITIES FOR EARTH SCIENCE. ($3.50)

RENEWABLE ENERGY ACTIVITIES FOR BIOLOGY. ($2.75)

RENEWABLE ENERGY ACTIVITIES FOR CHEMISTRY/ PHYSICS. ($2.75)

Some of these activities do appear in Solar Energy Education: Student Activities as well but many others are also provided. SR/TR

(182) THE SUN: ITS POWER AND PROMISE. Film Rental Center, Syracuse University, 1455 East Colvin Street, Syracuse, NY 13210. (16 mm film, 24 minutes, $18.50 rental)

This film shows the prime role the sun has played in man's energy history as the ultimate source of most fuel resources. With the latter diminishing rapidly, new techniques to trap and use the sun's power directly are explored. Spectacular views of the solar photosphere and disturbances are included. A fine secondary introduction to the topic. A study guide is provided. SR

(183) SUN UP TO SUN DOWN: UNDERSTANDING SOLAR ENERGY. Shawn Buckley. McGraw-Hill Book Company, 1221 Avenue of the Americas, New York, NY 10020. (166 page book, $6.95)

This is a deceptively childish-looking book because of the numerous and very clear illustrations. In reality it is a fairly thorough and mature treatment of solar technologies, couched in layman's language. The author uses the analogy of a leaky rainwater barrel for solar collection throughout the book - a bit labored, perhaps, but the points are driven home. Consider this as a valuable classroom reference. TR

U·T·I·L·I·T·A·R·I·A·N·I·S·M

New York State teachers have a rich source of instructional material in their electric power companies. Each company's resources are available free of charge to teachers and schools located within its service area. Printed material is often provided in bulk quantities. Each organization's literature, media, and programs are noted below. Use the following key to determine what energy topics are addressed.

Key

AE - alternate energy
BI - biomass
CL - coal
EC - energy conservation
EL - electricity
FU - fusion
GE - general energy
GL - geothermal
NG - natural gas
NU - nuclear fission
OL - oil
SR - solar
WD - wind

NEW YORK POWER POOL

New York Power Pool - Power Control Center, 3890 Carman Road, Schenectady, NY 12303.

The New York Power Pool is a consortium of New York's eight electrical power systems:

Central Hudson Gas and Electric Corporation
Consolidated Edison Company of New York
Long Island Lighting Company
New York Power Authority
New York State Electric and Gas Corporation
Niagara Mohawk Power Corporation
Orange and Rockland Utilities
Rochester Gas and Electric Corporation

The member systems use the pool as a means of coordinating cooperative activities, such as planning, research, and training. The Power Pool building contains a control center which charts and records transfers of bulk electrical power from system to system within the state.

Print, Multimedia, and Film Resources: booklets and films

How to order: Send a letter of request

Where to order: Public Relations
New York Power Pool
3890 Carman Road
Schenectady, NY 12303

or call (518) 381-2202

Topics available: AE, BI, CL, EC, EL, FU, GE, GL, NG, NU, OL, SR, WD

Other Services

Tours: Power Control Center, Computer Tour

School tours and on-site special energy information programs at the Power Control Center. Energy education presentations tailored to the special subject interest of visitors.

Free School programs:

Energy Today & Tomorrow - school assembly program
Energy-Environment Simulator - school classroom program

CENTRAL HUDSON GAS AND ELECTRIC CORPORATION

FILMS, TALKS, TOURS & EDUCATIONAL AIDS. (catalog) Central Hudson Gas and Electric Corporation, Information Services Division, 284 South Avenue, Poughkeepsie, NY 12601.

Print and Multimedia Resources: booklets, experiments, posters, kits

How to order: Use cards provided in catalog

Where to order: Above address or call (914)-452-2000, ext. 5352

Topics available: AE, EC, EL, GE, NG, NU

Film Resources

How to order: Use cards provided in catalog

Where to order: Above address or call (914)-452-2000, ext. 5439

Number of films: 55

Topics available: AE, EC, EL, GE, NG, NU, SR, WD

Other Services

Speakers bureau
Teacher workshops
Tours

CONSOLIDATED EDISON COMPANY OF NEW YORK

CON EDISON CATALOG OF FREE PROGRAMS, EXHIBITS AND LITERATURE, 1983-84. Con Edison, Consumer Education, 4 Irving Place, Room 1625-S, New York, NY 10002.

Print and Multimedia Resources: booklets, experiments, kits, posters

How to order: Use forms provided in catalog

Where to order: Above address

Topics available: AE, EC, EL, GE, NG, NU, SR

Film Resources

How to order: Call Consumer Education Representative
Bronx - (212)-562-4108
Brooklyn - (212)-834-3351 or 834-3352
Manhattan - (212)-460-6056 or 460-3692
Queens - (212)-830-6817 or 830-6816
Staten Island - (212)-390-7215
Westchester - (914)-997-6075

Number of films: 50

Topics available: AE, EC, EL, GE, NG, NU, SR

Other Services

Tours
Exhibits
Speakers (on certain topics, slide programs accompany speaker)

LONG ISLAND LIGHTING COMPANY

FILMS, TALKS, TOURS, EXHIBITS. (catalog) Community Relations Department, Long Island Lighting Company, 550 Stewart Avenue, Garden City, NY 11530.

Print and Multimedia Resources: booklets, coloring books, experiments

How to order: Send a letter of request to above address or phone: (516)-228-2226 or 2228

Topics available: CL, EC, EL, GE, NG, NU

Film Resources

How to order: Contact Film Library of your local BOCES

Number of films: 43

Topics available: EC, EL, GE, GL, NG, NU, SR

Other Services

Talks (Electrical Safety, Energy/Environment Simulator)
Exhibits (History of Light, Eisenhower Paintings, Osprey Exhibit)
Guided tours (juniors and seniors in high school only)

NEW YORK POWER AUTHORITY

EDUCATIONAL SERVICES. Contact: Director, Community Relations Division, New York Power Authority, 10 Columbus Circle, New York, New York 10019.

Print and Multimedia Resources: booklets, posters

How to order: Send a letter of request

Where to order: Above address

Topics available: AE, EC, EL, GE, NU

Film Resources

How to order: Send a letter of request several weeks in advance of showing date

Where to order: Above address

Number of films: 4

Topics available: GE

Other Services

Assembly and classroom programs
Exhibits
Speakers
Visitor centers and tours at: Niagara Project, Niagara Falls; St. Lawrence-FDR, Massena; Blenheim-Gilboa, Grand Gorge

NEW YORK STATE ELECTRIC AND GAS CORPORATION

EDUCATIONAL SERVICES CATALOG 1982-83. Consumer Affairs Department, New York State Electric and Gas Corporation, 4500 Vestal Parkway East, Binghamton, NY 13902.

Print and Multimedia Resources: kits, filmstrips, booklets, experiments

How to order:	Use order form in catalog
Where to order:	Above address
Topics available:	AE, BI, CL, EC, EL, GE, GL, NG, NU, OL, SR, WD

Film Resources

How to order:	Use order form in catalog
Where to order:	Above address
Number of films:	37
Topics available:	CL, EC, EL, GE, NG, NU, OL, SR, WD

Other Services

Classroom presentations
Assemblies
Teacher workshops
Energy centers to visit

NIAGARA MOHAWK POWER CORPORATION

ENERGY AIDS, 1983-84. (catalog) Niagara Mohawk Power Corporation, 300 Erie Boulevard W., Syracuse, NY 13202.

Print and Multimedia Resources: booklets, experiments, filmstrips, posters, spirit masters, games, kits

How to order:	Use card provided in catalog
Where to order:	Above address
Topics available:	AE, CL, EC, EL, GE, SR

Film Resources

How to order:	Use card provided in catalog one month prior to anticipated use

Where to order: Above address but films may be picked up at local Niagara Mohawk offices listed

Number of films: 30

Topics available: AE, CL, EC, EL, GE, NU, SR

Other Services

Visits can be arranged to the Nine Mile Point Energy Information Center by phoning (315)-342-4117 or (315)-474-1511

ORANGE AND ROCKLAND UTILITIES, INC.

EDUCATIONAL SERVICES CATALOG. Public Programs, Orange and Rockland Utilities, Inc., 1 Blue Hill Plaza, Pearl River, NY 10965.

Print and Multimedia Resources: booklets, kits, charts, filmstrips

How to order: Send a letter of request

Where to order: Above address or call (914)-627-2469

Topics available: AE, CL, EC, EL, GE, NG, NU

Film Resources

How to order: Send a letter of request several weeks in advance of the showing date

Where to order: Film Library
Orange and Rockland Utilities, Inc.
75 West Route 59
Spring Valley, NY 10977

Number of films: 35

Topics available: AE, CL, EC, EL, GE, NG, NU, SR

Other Services

Assemblies
Tours

ROCHESTER GAS AND ELECTRIC CORPORATION

Rochester Gas and Electric Corporation, 89 East Avenue, Rochester, NY 14649.

Print and Multimedia Resources: booklets and flyers

How to order:	Write Consumer Relations, Rochester Gas and Electric, 89 East Avenue, Rochester, NY 14649
Topics available:	AE, CL, EC, EL, GE, NG, NU

Film Resources

How to order:	Write to above address
Number of films:	40
Topics available:	AE, CL, EC, EL, GE, NG, NU

Other Services

Speakers
Tours